MEET FRED BOND

His background of twenty years in art schooling and advertising developed an appreciation for the best in pictures and color. He turned to color photography when 35-mm Kodachrome was introduced in 1936 and he has worked exclusively in color since, in all phases of color photography. The fact that his books have been best sellers is proof that they provide the kind of help amateurs want and need. No superficialities. Sound fundamentals that are the basis for all good color work. He is a Fellow of the Photographic Society of America and he is one of the four individuals given the La [illegible]elle Award "For his outstanding and remarkable contribution to a better understanding and greater enjoyment of color photography through his research, lecturing, judging and especially through his writings".

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Author
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"Kodachrome & Ektachrome From All Angles"
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INTRODUCTION

In this book I have attempted to pass on to you some of the results of my research, experimentation and experience in working exclusively in color since 1936.

Any book on photography should do more than merely list rules, tables and abstract facts. It is important to suggest, specifically, what should be done in a particular situation but it is more important to tell WHY it should be done as recommended. By explaining WHY a certain procedure produces a predictable result the reader is able to apply the procedures to HIS problems—to do his own thinking and arrive at his own correct conclusions.

It doesn't matter whether you shoot color "just for fun" or wish to exploit your creative instincts to the fullest, you certainly hope to continually improve your pictures. I cannot believe that anyone ever is satisfied with mediocre results. You have an investment in equipment and a continuing one in color film. Invest a little time in learning the fundamentals of good color photography, at least all those that apply to the type of subject matter that interests you most. It will pay off handsomely.

We should first learn what is a good picture. Neither the camera nor the film "makes" a picture. They only record what you SEE or CREATE. YOU have to compose the picture; YOU have to decide which light angle is best; YOU have to make adjustments on this mechanical device we call a camera. It can neither be blamed nor credited for more than its function in producing a picture. It is a robot no matter how "automatic" it may be.

My desire and hope is that the ideas and suggestions in these pages will stimulate new interests in this fine hobby—that they will help you see things with a fresh eye—that they will encourage you to attempt projects you have felt were beyond your capabilities.

→ Let me repeat—do your own thinking. A little serious thought will solve many photographic problems faster and more satisfactorily than the most elaborate equipment—and at much less cost.

FRED BOND

CHAPTER ONE

COLOR FILMS AND LIGHT SOURCES

Each type of color film is balanced to a specific light source although each film can be used with other light sources by use of the proper Conversion Filter (see table on page 84). Below are the common light sources and type of film to be used with each, without filter.

LIGHT SOURCE	COLOR TEMPERATURE, DEGREES K	FILM TYPE
G.E. Mazda 3200 degree lamp	3200	Type B
Photoflood No. 4 (at rated voltage)	3415	Type A
Photoflood No. 2 (at rated voltage)	3425	Type A
Photoflood No. 1 (at rated voltage)	3440	Type A
Most Photoflash lamps (clear)	3800	Type F
Sunlight plus sky reflection, midday, about	6100	Daylight

Popular Artificial Light Type Color Films

KODACHROME TYPE A ASA 16

Balanced to photoflood illumination. Kodachrome is a high-contrast, grainless film with all primary colors intensified somewhat. All Kodachrome films have less latitude than some other color films. Color rendition is more faithful when subject illumination is balanced to a ratio of not more than 2 to 1. Underexposed shadows are often colorless but are not "smoky." A very consistent film from one emulsion batch to another in both color quality and speed. Can be converted to daylight use with excellent results. Many who divide their shooting between indoors and outdoors use this one film exclusively.

Available in 35mm and 828 rolls. Cannot be home processed.

KODACHROME TYPE A ASA 40*

A high-contrast, grainless film very similar to the slower Type A Kodachrome. Principal difference is in speed although the yellows are more lemon yellow and blues seem slightly brighter. The faster speed makes this film more versatile without some of the handicaps of super-speed films.

**Expected to be available in 35mm and 828 rolls in the near future, at speed at or near that given above. Cannot be home processed.*

KODACHROME TYPE F

Balanced for exposure to clear flash. This film is similar to Type A Kodachrome in general characteristics. It is provided to meet the increasing demand for a film that can be used with clear flash without a filter. This film can be converted to other light sources with filters (see Filter Table). However, when converted to photofloods or 3200K lamps it is not as fast as Type A film with these light source..

Available in 35mm and 828 rolls. Cannot be home processed.

EKTACHROME E-2, TYPE F

Balanced to clear flash illumination. All Ektachrome emulsions have more latitude than Kodachrome and are less contrasty. Faithful color will be held in both light and dark areas when subject contrast is not more than 2½ to 1. Colors are slightly softer than Kodachrome, yellows are more toward chrome yellow and greens are less intense. As with all films in which the dye-forming materials are in the emulsion there is a grain but not noticeable when properly processed and if not enlarged excessively. Converted to photofloods with proper filter this film has the same speed as Type A Kodachrome.

Available in 35mm, 828, 127, 120 and 620 rolls. Can be home processed — E-2 (Improved) Kit.

EKTACHROME EHB-135, TYPE B ASA 125

Balanced to 3200K illumination. A superspeed film with the same general characteristics as other Ektachrome films although it tends to be more grainy, the degree of grain depending partly upon processing. Colorwise, this 35mm film has good reds, flesh tones are excellent, but blues and greens are not quite as intense as in Kodachrome. Its speed permits shooting indoors with available light—at home, the theater, sports events, and dozens of other such subjects.

Available only in 35mm rolls. Can be home processed, E-2 (Improved) Kit.
NOTE: Some Ektachrome emulsions are faster or slower than the ASA rating. Follow the data with each roll of film.

ANSCOCHROME TUNGSTEN (TYPE B) ASA 25

Balanced to 3200K illumination. Colors are not as intense as in Kodachrome and are often described as more "natural." This film has good latitude but some emulsion batches record false or "smoky" color in the shadows. Claims for Anscochrome state that tests show no appreciable change in color balance in exposures as short as 1/5000 sec. or as long as 4 secs.

Available in 35mm, 828, 120, 620 and 127 rolls. Can be home processed in Anscochrome Kit.

SUPER ANSCOCHROME, TUNGSTEN (TYPE B) ASA 100

Balanced to 3200K illumination. A superspeed film with the same general characteristics as regular Anscochrome, in color and contrast. Both types of Ansco color film have about the same or slightly more exposure latitude than Ektachrome. This film is often more grainy than the slower Anscochrome.

Available in 35mm, 120 and 127 rolls. Can be home processed in Anscochrome Kit.

DYNACHROME TYPE A ASA 12

Balanced to photoflood illumination. A Kodachrome-type emulsion. As it is the newest color film produced in the U. S. its uniformity in emulsions and processing has yet to be established. A slightly slower film than Kodachrome A. Convertible to daylight and other light sources with the same filters as for Kodachrome.

Available in 35mm and 828 rolls. Cannot be home processed.

DYNACHROME TYPE F

Balanced to clear flash illumination. An emulsion similar in characteristics to Kodachrome Type F. Convertible to other light sources, see page 84.

This film available in 35mm and 828 rolls. Cannot be home processed.

NOTE: There are daylight type films of all of the trade names just listed, shown in the filter table, page 84.

NEGATIVE COLOR FILMS

KODACOLOR, in Daylight, no filter ASA 32

This film is included for slides because it is such a versatile medium. It provides the master negative from which three types of positives can be made—1) positive transparencies, same size or larger and much superior to duplicates from positive transparencies, 2) color prints up to large sizes and 3) black-and-white prints on Panalure paper. Although this is a flash-type film no filter is needed in daylight when color prints are made commercially. However, the proper filter must be used when shooting in daylight if you make your own prints or transparencies. The proper filter is always needed for photoflood or 3200K illumination.

with Daylight . . 85C filter, ASA 25
with Photoflood . 82A filter, ASA 20
with 3200K lamp . 82C filter, ASA 16
with "Strobe" . . 85 filter
with Clear Flash . no filter

Available in 35mm, 828, 620, 120, 616, 116 rolls. Can be home processed—Kit C-22.

AGFA COLOR NEGATIVE CN 14

A color negative material of extremely fine grain and contour sharpness, permitting greatly enlarged color prints. Filters are not recommended because color balance is adjusted when color prints or transparencies are made. Recommended exposure indexes are 20 for daylight, 16 for artificial light.

Available only in 35mm rolls. Cannot be home processed at present.

AGFA COLOR NEGATIVE CN 17

Similar to CN 14 except for faster speed and consequent slight increase in grain. Recommended exposure indexes are 40 for daylight, 32 for artificial light.

Available in 35mm, 620, 120 and 127 rolls. Cannot be home processed at present.

CHAPTER TWO

ELEMENTS OF A GOOD COLOR SLIDE

Do not shy away from a discussion of what makes a "picture" because you shoot color slides "just for fun." Even though your interest is limited to snapshots of family and friends or record pictures of a vacation trip, the observing of a few simple rules will make all your slides more enjoyable to view and will make every new shot an improvement over previous ones.

If you are interested in exhibiting your slides, continual study of ways to improve the quality of your efforts is a must.

All good pictures have these three essential "ingredients":

1. INTEREST — for all who view them. The picture must tell some kind of story; express a mood; make a pattern.
2. GOOD COMPOSITION — pleasing arrangement of objects, mass, line and contrasts.
3. GOOD TECHNICAL QUALITY — highly important in color.

Interest

It is rather difficult to describe "interest," but it should be given *first* consideration in selecting subject matter for your color shooting. Ask yourself, "Is it interesting or can it be made so?" Interest can be injected into a thousand commonplace subjects by choice of a better shooting angle, or by getting closer or farther away from the subject, or by raising or lowering the "horizon line" (and there always is one, imaginary though it may be), or by using a different focal length lens if you work with a camera with interchangeable lenses. or zoom.

Good Composition

The color shooter is confronted with two problems of composition —composition in terms of arrangement of mass, line and tone values and composition in terms of color arrangement or association. If I were obliged to state one general rule that can be applied to all types of subjects and situations, but which is flexible enough to allow full play to imagination and ingenuity, it would be this:

Orderliness—without monotony.
Variety—without confusion.

and these apply as much to the association of color as to that of line and mass. (See Chapter 3, "You Are Working in Color.")

Figure Shots

A most common error in making figure shots, for which there is little excuse, is that of placing a standing figure in the center of a horizontal picture. The proportions of the figure suggest a vertical format. So framed, the figure image can be made larger, and such better use of the picture space eliminates uninteresting and totally irrelevant background, in the majority of cases. If the figure is only an incidental part of a scene that is a different matter, and entirely aside from the point just made.

It is difficult to properly frame close-up shots of figures unless you have some means of correcting parallax (the difference in the view seen through the finder and that seen by the lens), but most of the errors in proper placement of the image in the picture area are due to careless handling of the camera.

While it is often permissible to place a full face portrait near the center of the picture area, it is just as often advisable to turn the figure slightly even though face view is head-on. Or if one hand can be included in the picture, it can help break the static balance of head-on shots. By and large, something near a three-quarter view is more interesting, especially if the figure is placed out of center. Heads should be above center of the picture area, and more background area should be allowed in "front" of the face—on the side toward which the subject is looking. Even in three-quarter views, it is more interesting if the body is turned slightly so it will not face in the identical direction as the head, as this gives a slight sense of movement.

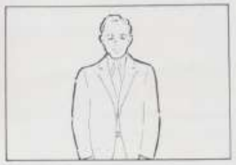
Too many close-up figure and head shots are rigid in pose and lack a sense of ease and naturalness. While a slovenly pose is probably more objectionable than a "frozen" one, there is a happy medium. Let your subjects sit long enough to fall into some natural posture, then ask them to try to hold that without forcing. With a few tries you will find that most subjects will assume better poses than you can plan, and they will most likely be characteristic of the subject, a part of the expression of the individual's personality.

Groups of figures are always difficult to arrange in anything that approaches a pleasing composition. But two or three figures are not too difficult to handle, if a little thought is given the problem.

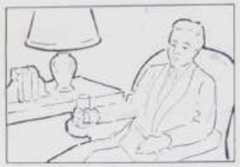
The little sketch suggests one arrangement of three figures. Obviously, three standing figures, all facing directly toward the camera is monotony in the extreme. If one figure stands, another sits on the ground or floor and the third is seated on a bench or stool, there is, automatically, variety in height of the figures, variety in the forms the figures make, and variety in the way the figures are turned, or there should be. To be pleasing, close-up shots of two or more figures should have a feeling of easy informality—a natural casualness.

NOT GOOD

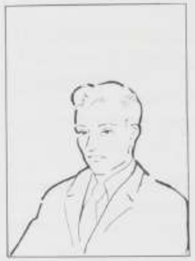
BETTER THIS WAY



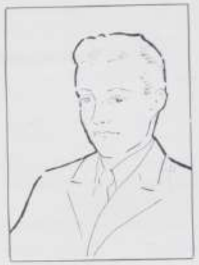
A common error, partly because of habit and convenience, is to frame a naturally vertical picture in a horizontal format. This usually includes too much extraneous background.



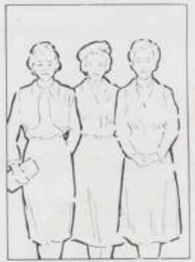
Elements in a horizontal picture should pleasingly fill the area, and some of the basic lines should run in a general horizontal direction although not necessarily parallel to the base line.



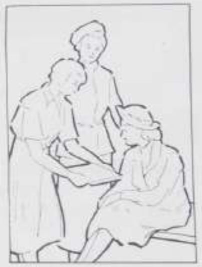
Another common error, on close-up shots, is that of placing the center of interest too low in the picture frame. Be extremely careful in framing close-ups.



This is better image size, in relation to the frame, and better placed. If your lens does not permit working close, get a supplementary "front" lens.



Next to equal division of spaces, figure arrangements such as this are almost as monotonous. This common fault can be overcome by a little effort and planning.



Three figures arranged in some such fashion as this sketch suggests, gives variety in figure heights, areas the figures occupy, and avoids the usual "stiffness" of group poses.

Still Life Studies

There are as many possibilities for still life compositions as there are objects that might be used and arrangements in which they might be placed.

It would seem that our general rule of orderliness without monotony and variety without confusion should be the guiding influence in the conception of such subject matter. There are endless subdivisions of the rule, of course, but they all seem to get back to the generalization.

One departure might be to fit the format to the objects, or make an arrangement to fit the format. In the first instance objects whose shape suggests a horizontal picture should not be framed in a vertical format, and vice versa. This seems obvious but it is surprising how often this error is made unconsciously. The sketch shows an extreme example, but it is purposely so to emphasize the point.

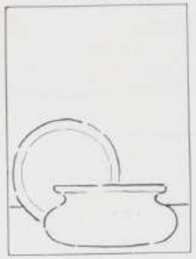
The second "error sketch" is another example of order WITH monotony. It is balanced, identical pairs of shapes are used, and the spacing of the objects is bad. This is another extreme example, but such a composition could still be bad and be much better than indicated. There should be variety in shapes, sizes, textures (not so important as the other two), and color, even though subtle. If the objects or elements are relatively simple, there is little possibility of confusion but variety is almost assured. Also, as the sketches are intended to suggest, when most of the objects in a still life are vertical in general shape, a vertical format is usually best, for the picture shape helps emphasize the forms rather than oppose them.

It seems that flower studies cause many workers the most difficulty, for some inexplicable reason. I presume the photographer becomes so thoroughly absorbed in the beauty of the flowers themselves that he temporarily forgets what he knows about arrangement. I have seen hundreds of slides that could have been very good except for one or both of two reasons—(1) the flowers and/or receptacle were placed squarely in the middle of the picture area, and (2) the camera was too far away from the subject. The result—a little study floating rather aimlessly in a monotonous background. How easily such faults can be corrected. First, get closer to the subject; place it out of center of the picture area; break the monotony of the group by placing one or two of the flowers on the table or stand, whatever is being used as the base.

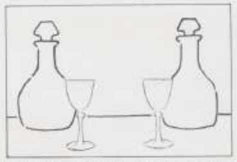
The same rule of *orderliness with variety* holds true with flower studies, as with all other compositions. Make the flowers THE picture; don't waste too much picture area on background and uninteresting foreground areas.

If you are interested in entering slides in any of the exhibitions around the country, I would like to caution you that "ordinary" flower shots have little chance of acceptance, exceptional ones make the shows.

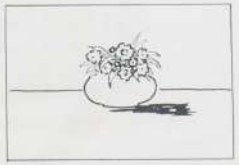
NOT GOOD



In still-life subjects the form of the objects usually suggests whether the composition should be vertical or horizontal in shape. Objects like these would suggest a horizontal format.

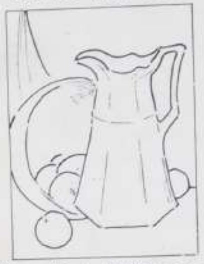


Absolute balance can sometimes be used with striking effect when a static impression is desired but with objects such as these the result is too monotonous. There is also too much background in relation to object sizes.

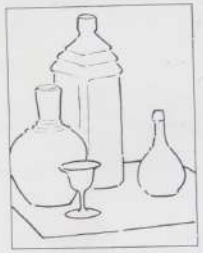


This is a slightly exaggerated illustration of a too common fault in many color slides—image size too small, too much background, and subject placed squarely in the center of the picture frame.

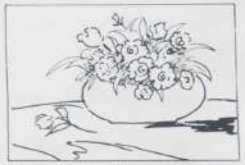
BETTER THIS WAY



These objects fit the vertical format easily and naturally, but if framed in a horizontal there would be too much background.



If you will recall the basic general rule of order without monotony and variety without confusion you will see in this simple composition the necessary variety in sizes and shapes.



First, work closer, for larger image size. If your lens will not permit reasonably close work, a "front" lens will improve results. The subject is the picture—get rid of surplus background.

What Rules to Follow

It would be both unwise and restrictive to arbitrarily say "do this" or "don't do that," even if there could be general agreement on such a set of rules.

We should learn to see subject matter in terms of mass or form, and then devise orderly, interesting arrangements of those forms. If the forms are portable we move them about. If not, we change camera position to bring them into some kind of pleasing orderliness.

1. *Pleasing division of areas.* No two areas or masses should be identical in size except in formal, symbolic or balanced compositions. Neither should the picture be made up of a "smattering" of small areas, like a mosaic, unless it is a "pattern" shot. Size of areas need not be synonymous with their relative interest in the picture. The center of interest may and often does occupy the smallest area. This is especially true in color, for this center of interest can be the purest, brightest color spot, made more compelling because of its contrast with larger areas of grayer color, which can be lighter or darker, for still greater contrast.

2. *Interesting placement of center of interest.* We have mentioned before that it is astounding that such a high percentage of color slides have the center of interest in the center of the picture. This seems to be particularly true of single figure subjects, single flower shots and such. This "dead center" placement is about what the term implies — it is monotonous and static. Again, the exception can be a shot of some formal subject or pattern where the dead center placement is used effectively to express stability or immovability.

There is no rule that says where the center of interest should be placed. The subject, the story it tells, the subordinate elements—all these help determine the most pleasing and effective placement.

3. *Balancing the elements or areas.* The word "balance" immediately suggests *equal* balance of two objects or areas, but we mean quite the opposite except in subjects that demand equal balance for the sake of a static effect.

Rather, the kind of balance meant is that of balancing a large object, mass or area, with a smaller one (need not be a like object) on the principle of the old steelyard. Such balancing calls for the larger object, mass or area being nearer the center of the picture than the smaller element that serves to set up the balance.

For a broad general rule there is none that is more universally applicable than *Order without Monotony* and *Variety without Confusion.*

C H A P T E R   T H R E E

YOU ARE WORKING IN COLOR

Present every where at same time

COLOR is so omnipresent that most of us take it for granted, without much question as to what it is, where it comes from, and why it is sometimes somewhat illusive.

As a starter, keep in mind that *no* object has any inherent color (excepting such things as luminous organic life). There is no such thing as a green tree or a yellow lemon *except* when light is present, and then such color as exists is a physiological and psychological phenomenon, otherwise there would be no such thing as color-blindness. I recall having heard a physicist ask an audience what color they thought the inside of a watermelon was before it was cut. His answer, of course, was that it had no color until exposed to light.

As we all know, but sometimes forget, the "local" color of any object is determined by that object's reflective and absorptive response to white light. It has the capacity to absorb some of the spectral bands in the white light, and reflect others. The ones it reflects are what we consider the object's color. For instance, a red apple is red because it has the ability to absorb most all of the color bands in white light except red, which it reflects.

The more white light (greater volume) poured onto an object the more intense its color becomes *up to the point of each object's full color saturation.* Decrease the volume of light and the intensity of the object's color decreases correspondingly.

This point of *full saturation* needs a little explaining, even though you have proved the fact many times without, perhaps, being conscious of what had caused the trouble. For example, a yellow object such as a lemon or yellow apple is not nearly as intense in color in full, brilliant sunlight as it is under a hazy sun or light overcast. The reason—the object in brilliant light has absorbed all the white light except yellow that it can, but there is still a *surplus* of white light, which the object reflects back as white light, thereby diluting the yellow color. We photographers often falsely assume that this is due to over-exposure—the color is "burned out", we say.

It is true that we have a tendency to over-expose yellows (or other light colors) in subjects that contain other, darker colors, for in trying to hold true color in the darker ones we give more exposure than is needed for the yellow alone. But even a "correct" exposure under strong, sharp light will not register that yellow with as much real color saturation as under a weaker light. This matter of "excess" illumination is of great concern to painters and explains, partially, why they prefer to work under a soft north light.

To get back to what happens when we decrease the volume of light below "normal"—you only need to recall the interior of your own home. When it is fully illuminated, the objects in a room stand out in the full brilliance of their color, but decrease the volume of light and the colors of all objects pull together, or tend to merge into a series of color-tinted grays.

So much for this general behavior of color and how it is altered and influenced by the volume of incident light.

Just what is color? Rather than depend upon our individual concepts let's see what Webster says about it:

> "Color is a quality of visible phenomena, distinct from form and from light and shade. It is a sensation evoked as a response to the stimulation of the eye and its attached mechanisms, by radiant energy of certain wave lengths and intensities. All colors are divisible into two classes—*chromatic colors*, as reds, yellows, greens, blues and purples; *achromatic colors*, including black, white and the series of grays intermediate between black and white, which differ from each other only in the degree of resemblance to white and difference from black."

It is especially important that we keep our thinking straight on the fact that color in or on objects is, as it were, an exterior "coating" on opaque ones and is apparently an "imbedded" property in transparent and translucent materials. As Webster says it is distinct from form, and it certainly is, which is the reason why color alone cannot give "structural form" to any picture. The form is made by the objects, not the color. Webster also says color is distinct from light and shade, which it is, for the color we photograph is "lighter" or "darker" only because of more or less volume in the incident light being used.

Two Aspects of "Good" Color

We color photographers have two problems in color. The first is good color rendition of the colors in our subject. This is a matter of the correct kind or quality of light for the film being used; the quality of the camera lens; and the matter of correct exposure.

The second problem, and the one which bothers most of us rather seriously, is that of pleasing association of colors in our subject. We cannot always control them, but we can modify the association in more cases than is usually suspected. The beginner in color photography has a tendency to prefer a riot of color—the more and louder the color the better. The more advanced worker often goes to the other extreme and strains to produce the most subtle color results possible, and still have what might be considered a color picture.

Neither approach should be condemned as such. It is very much a matter of appropriateness. If the subject is colorfully costumed figures, the intensity and brilliance of the color is part of the story. If, on the other hand, the subject is rather colorless, the subtle color will help express the mood or character of the subject. In both cases the color effect is "appropriate".

But too often, color shooters drag color in by the heels, just for the sake of a color spot, and such practice is bad, or can be very discordant if the result shows evidence of what was done. Splashes of color for color's sake is one thing—color emphasis is quite another. More about that later.

There Is a Language of Color

All of us know the musical scale. We know that "A flat" and "C sharp" mean just one thing and the same thing to everybody around the globe. But what is red, or green, or purple-blue? When you say "red" one person visualizes a hue like that in the American flag, another thinks of red as the color of red wine, and still another may have a mental picture of the sun as it drops below the horizon.

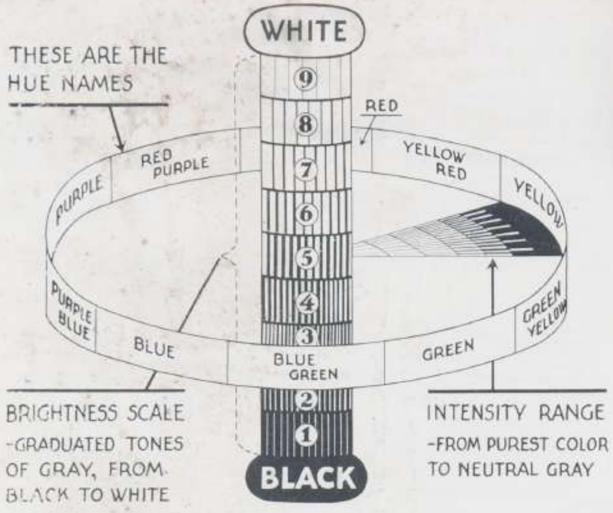
We have no common language of color, and it is all but impossible for the average individual to verbally describe any specific color, other than the primary ones, and most have difficulty with those.

For the beginner in color, if he really wants to understand and use color intelligently, the Munsell System of Color Notation can help him organize his thinking in a very simple, tangible and directly usable way. This System attributes to color three dimensions in somewhat the same way three-dimensional objects are described by linear measure.

If one describes a board as being 10 feet long he has defined one dimension, but is the board wide and thick or thin and narrow? If the description says the board is 10 feet long and 1 foot wide we have a better mental picture of it but it isn't complete until we know the board's thickness. When we learn that the board is 10 feet long by 1 foot wide by 1 inch thick, then and only then is its linear description complete, leaving nothing to the imagination.

Color Dimensions

The Munsell System denotes color just as specifically as three linear dimensions describe the size and shape of a piece of lumber. The subject is too ramified to be covered here, and it is not necessary to understand more than the principles involved in order to apply these color rules to color photography.



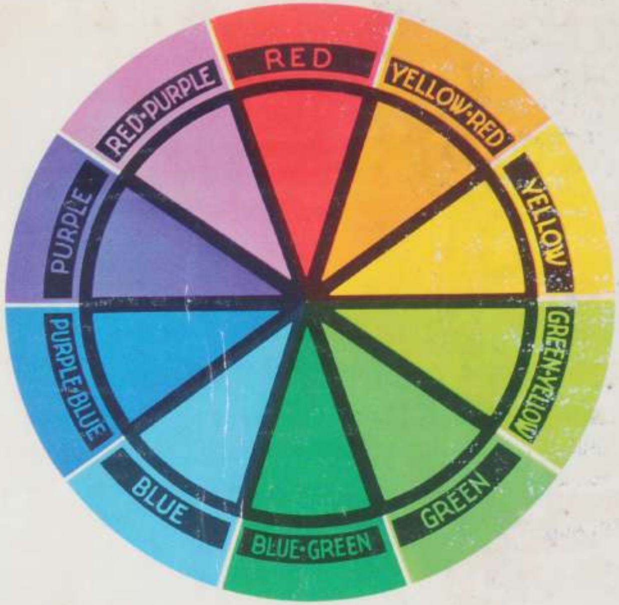
The three dimensions of color are:

1. *The Hue Name, such as red, yellow, blue and so on.*
2. *The Intensity or Purity of the Hue.*
3. *The Brightness or Tone Value of the Hue.*

The Color Wheel illustrates what is meant by Hue names. The graph above emphasizes the distinction between the three dimensions—Hue is red or yellow and so on around the wheel; the color is *light* or *dark* (the vertical pole); and it is *weak* or *strong* depending upon whether it is pure color or is grayed. Pure color would be at the extreme distance from the pole—it becomes grayer as it approaches the pole. An easily recognized demonstration of *intensity* of color is in a landscape where there are near and distant objects of the same color—a tree, a house, or flower fields. The distant object appears less intense in color because of the "graying" effect of the intervening atmosphere. This may seem a little confusing until it is given some study, but forget the complications for the moment and remember these three things:

1. Every hue or color has a name.
2. Every hue or color is *light* or *dark* in tone value.
3. Every hue or color is *weak* or *strong* in intensity or purity.

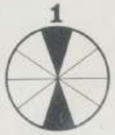
(Continued on page 19)



THE COLOR WHEEL

This Wheel designates the five Principal Colors or Hues of the visible spectrum, which are Red, Yellow, Green, Blue and Purple (Violet). The five hues occupying the in-between segments are known as the Intermediates. All of them are made through mixture of the two Principal Hues immediately adjacent to the Intermediate which they create through admixture.

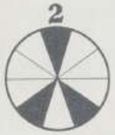
1



Complementary Colors

All paired hues are Complements

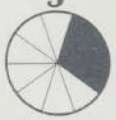
2



A Split Complement

Any three hues spaced as above

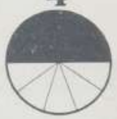
3



Related Colors

Any two or three adjacent hues

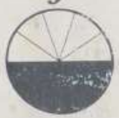
4



"Warm" Colors (advancing)

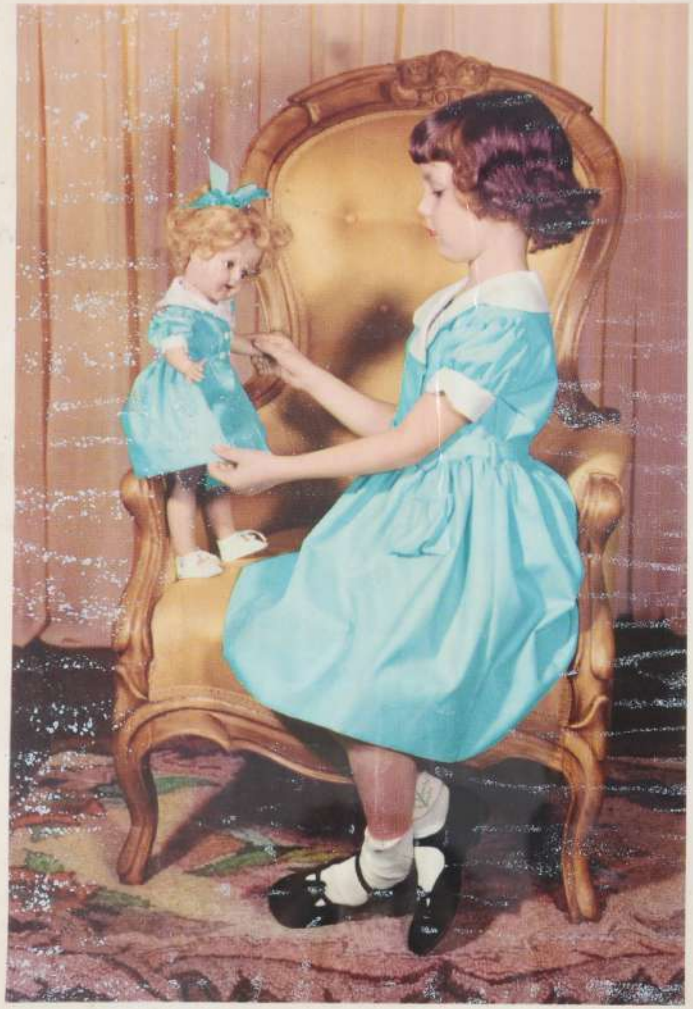
Red or Yellow predominate

5



"Cool" Colors (receding)

Blue or Green predominate



To be specific, apply the three dimensions to two roses—one might be red, rather dark and intense in color, the other might be pink, and if so it would automatically be lighter in tone value and less intense in color. It is pink because it is red diluted with white, which makes it both lighter in tone and weaker in purity of red color.

Keep these dimensions in mind as you analyze color. *First,* learn to associate all hues or colors with one of the ten in the Color Wheel, for every color is related directly to one of those groups. *Second,* see the color in terms of tone value, just as you would judge the subject for a black and white shot. This matter of tone value only means that a particular object is reflecting more or less of the light falling upon it, which is the factor that determines correct exposure, not the color of the object. *Third,* identify the *strength* of the color—whether it is intense and pure or whether it is "diluted" and weak.

Contrasts Make the Picture

It is obvious that we can't make a black and white picture of objects of the same tone value, without modeling or shadows. Tone contrasts are essentials in making a picture when done in monochrome.

When working in color we have the extra advantage of two added contrasts—that of contrast between hues or colors, such as any pair of complementary hues (as red and blue-green, yellow-red and blue, etc.) and that of the contrast between weak and strong hues. This contrast is endless; it might be that of a weak purple against a strong purple or a weak purple-blue against a strong yellow; any one of hundreds of combinations. And there is tone value contrast (as in black and white), light colors against dark ones; the variations are numberless.

A Modified Complimentary Color Scheme (opposite page)

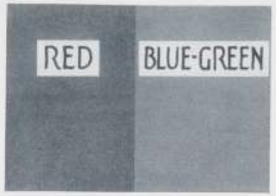
The color illustration opposite demonstrates that we need not employ several hues in order to produce a colorful picture. To use only two hues could be monotonous but sufficient variety is secured when slight variations of one hue are introduced. Refer to the Color Wheel and note that Yellow-Red is the complement of Blue. But instead of Yellow-Red we use a hue in the chair upholstery more toward Yellow and the background drapes tend somewhat toward Red, but both of these hues are more closely akin to Yellow-Red than they are to a pure Red or pure Yellow.

This slight departure from the exact complement of Blue is one of those subtle breaking of the "rules" that is not only admissable but is, more often than not, desirable in relieving the rigidity of a complementary hue association. Reduced to simple terms and over-simplified, we have a composition in which a cool hue is superimposed upon a larger area of warm hues, producing good *hue contrast*. There is but little *value contrast* (disregarding the small accents) and not much more *intensity contrast*. One pleasing aspect of this color composition is the repetition of Blue, in orderly steps of area, from blue hair ribbon on the doll, to the doll's dress, and finally to the dress of the little girl.

Order with Variety, in Color

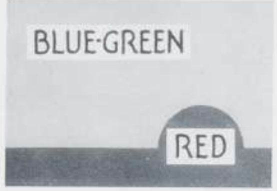
There is no better way to avoid chaotic color results than to follow the rule of order without monotony; variety without confusion.

Black and white diagrams call for a little imagination, when discussing color, but the principles involved can be demonstrated.



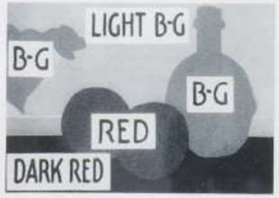
A pair of complementary colors, each at full intensity, occupying equal areas. Not good.

Let's start with a monotonous subject and see how we might add variety without confusion. Dividing a picture area into two equal parts is the most monotonous division. In this first diagram equal areas of two complementary colors at full intensity is suggested. While it employs one of the three contrasts (contrast in hue), there is little contrast in tone value (they are about equal in "brightness"), and there is little contrast in intensities as both colors, in their pure state, are rather strong.



The red at full intensity, occupying a smaller area; blue-green grayer, occupying a larger area. Better relation of area sizes, more contrast in color intensities.

The second diagram indicates an unequal division of areas, to break the monotony of "half and half." In doing so, we introduce a rule that aids in producing a "balanced" color composition—that of the relation of the *intensity* of a color to the size of the area it occupies: *the smaller the area the more intense the color can be; the larger the area the less intense the color should be.* In this case, the red might be full intensity; the blue-green somewhat grayer than in its purest state. We now have some variety in areas and in color intensity, and the variety gives some contrast.



For more variety, two reds are used, one bright, the other darker and grayer. Full intensity blue-green with a lighter, weak intensity blue-green gives still further variety and additional contrast.

Without introducing a new hue we can add still more variety, as suggested in the third diagram, by employing two kinds of reds and two kinds of blue-greens—a bright red and a dark red; a fairly strong blue-green and a lighter, weak one. This automatically breaks up the picture area into more areas, which should vary in size in relation to the intensity of the color used in each.

A composition made up of just two hues and white, the white added for accent and further contrast. This composition is a further development of the diagrams shown on the preceding page and follows the suggestion in the third diagram—two reds of different intensity and tone value, and two blue-greens, one full intensity, one lighter and grayer.

In rather simple form we now have contrast *in area sizes*, contrast *in hues* (a pair of complements), contrast in *tone value* (two values of red and two of blue-green), and contrast *in intensity of color* (a dark red is weaker than a pure red; the light blue-green is weaker than the smaller area of stronger blue-green).

The Picture the Exercise Produced

The still life above is shown to indicate how the rules we have been discussing can be followed to a successful conclusion. This is not a startling picture but as an exercise in color composition and color association it demonstrates, I think, that it is much safer to start with a few simple elements and then add variety to whatever extent you feel you can control, without destroying the basic simplicity or without creating confusion.

You can get still more variety in several ways—(1) by adding one or two additional hues—(2) by adding one or two objects of the same hue as ones already in the composition but different either in tone value or intensity of color. Such new objects, for variety's sake, should be different in size, shape and contour from those already in the picture. And don't forget the rule that strong colors should be confined to the smaller areas, the weaker ones to the larger areas, IF you wish to maintain a "balance" between strong and weak colors.

Color compositions need not be "balanced"—they can be predominantly "warm" or "cool," if such effect is desired, or they can be made up entirely of related colors such as any three or four adjacent to each other on the Color Wheel. In any event, do not use all "pure" or strong intensity colors, but get some variety in intensities as well as in tone value—some weak, some strong, some light, some darker.

Adding Variety with Neutral (achromatic) Colors

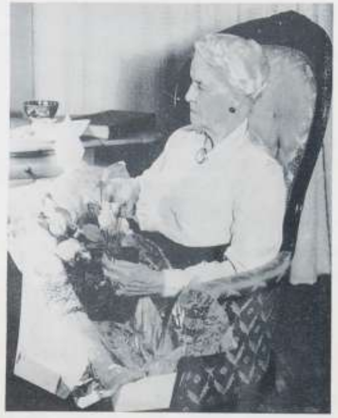
In the still life of the apples and bottle we added to the colors designated in the three little diagrams by introducing a touch of white—the white plate. Red and blue-green, as colors, are a little on the "sour" or heavy side and a spot of white gave them some life.

Few color workers appreciate the possibilities in the use of white, black and gray—to add contrast in kind of color as well as in tone value. A little white will freshen up a composition made up of middle value and darker colors; a little black or dark gray will add strength to a group of light value or weak intensity colors; and a judicious use of gray in the background, sometimes in rather large areas, will make the colors against it seem more brilliant and intense IF there is some value contrast between the gray and the colors.

Applying the Principles to Figure and Portrait Studies

The still life was used to establish one kind of color association, that of a pair of complementary hues.

The rules we have been discussing were applied to this figure study. Colors selected were the three of a split complement—red, yellow, and blue (see Color Wheel). A split complement is made up of one of any pair of complements (hues directly across the wheel) and the two hues adjacent to the second hue of the pair. In this case the complementary pair was blue and yellow-red; by retaining the blue as one of our three hues we get red and yellow as the two hues adjacent to the yellow-red.



A color composition made up of three hues of a split complement, plus white and gray. See text for hues used and definition of a split complement. (Also see Color Wheel, page 17.)

The chair, the blouse and the flesh tones were all variations of red, the roses were the yellow, and the fancy paper wrapping in the box was a soft but rather intense blue; the background was a warm neutral—monk's cloth. The white ruffle provided a needed light value touch. Simplicity was preserved by using only one area of yellow, one of blue, and by keeping the reds closely grouped. These reds (pink blouse, rose red chair, and the flesh tones) were sufficiently different in tone value and intensity of color to provide plenty of variety.

From the standpoint of color the composition has *color contrast, tone value contrast,* and *color intensity contrast,* but none of the contrasts are extreme. The comparatively short range of the value contrast made it possible to render all colors more faithfully at an exposure based on a meter reading of the middle value.

The color scheme used for this figure study is only one kind of orderly association of color. It was particularly good for this subject because it seemed "appropriate." The soft pale pink blouse keyed in well with the subject's fresh flesh tones, and the stronger red of the old lady's chair made the pink blouse and flesh tones seem more delicate by comparison. A contrasting color on the chair might have detracted from the flesh tones because of harsh color contrast. Certainly a strong color in the background would be inappropriate for such a subject.

Adding Color to Landscape Shots

Although this book is devoted to indoor color work most of you also shoot landscapes, hence these suggestions. There are times when color can be added to landscape scenes with excellent effect, as in the one shown here. The only arguments against using figures is in those cases where the figures actually detract from the interest in the scene or when the costumes add nothing in the way of color interest or color contrast. The other exception might be that you just don't like figures in landscapes. In any case, don't consider it a landscape shot if the figures fill half the picture area, covering up much the viewer would like to see. Such shots are not landscapes, they are figure studies outdoors.

The over-all green and blue color predominance of landscapes can be "warmed up" and given color contrast by introducing figures in warm colored costumes, and they need not occupy much area.

The figures (page 23) do not compete for attention—they are not too large—in fact they seem to add a feeling of bigness to the scene.

Sometimes a flowering bush, a stretch of grass, rocks or even an expanse of bare earth (if it has any color) can be used in the foreground as a complementary color area. Before you shoot analyze the scene to determine whether it needs some foreground color to help balance the prevailing color of the general scene. Interesting foreground color often snaps up an otherwise ordinary or expansive landscape shot.

Relationship of the Color Wheel Hues

In creating a color composition or in introducing new hues into an existing one it is rather necessary to understand the relationship of the various hues. The following listing groups the ten hues of the Color Wheel into three types of relationship—that of contrasting colors and those that are related. The colors grouped in pairs and in threes are not necessarily good color schemes, although most any colors can be combined in weak intensities, even the most contrasting ones.

CONTRASTING HUES

Complementary pairs, especially in their "pure" state, set up very strong color contrasts.

Red and Blue-Green

Yellow-Red and Blue

Yellow and Purple-Blue

Green-Yellow and Purple

Green and Red-Purple

(Complementary pairs are those hues directly opposite on the Color Wheel. Split Complement trios are one of a pair of complements plus the two hues adjacent to the second hue of a complementary pair)

CONTRASTING HUES

The hue across the wheel from the related pair of a split complement trio is a contrasting hue.

Red contrasts with Green & Blue
Yellow-Red vs. Blue-Green & Purple-Blue
Yellow vs. Blue & Purple
Green-Yellow vs. Purple-Blue & Red-Purple
Green vs. Purple & Red
Blue-Green vs. Red-Purple & Yellow-Red
Blue vs. Red & Yellow
Purple-Blue vs. Yellow-Red & Green-Yellow
Purple vs. Yellow & Green
Red-Purple vs. Green-Yellow & Blue-Green

RELATED HUES

Closely related colors in groups of 3. Each group has one color in common.

Red, Y-R and Yellow

Y-R, Yellow and G-Y

Yellow, G-Y and Green

G-Y, Green and B-G

Green, B-G and Blue

B-G, Blue and P-B

Blue, P-B and Purple

P-B, Purple and R-P

Purple, R-P and Red

R-P, Red and Y-R

Applying the Rules of Color Association

The simple examples described have been presented only to help you organize your thinking. In no wise should they be considered the best possible association of color for the subjects; they are merely one type of pleasing association. The grouping of hues on the preceding page needs some explanation. First they are listed in these groups only for identification of their relationship to each other.

Contrasting Hues. By contrast we mean much the same as the contrast between black and white. In fact, when such opposite colors are mixed they produce a similar result—white mixed with black produces a gray—red and blue-green mixed also produce a kind of gray or "muddy" color. The same is true of any pair of complementary colors or the trio of a split complement. In other words, contrasting colors are contrasting because they "clash" and tend to annihilate each other—visually as well as in admixture. This visual effect is evident when two extremely brilliant contrasting hues are side by side — the colors tend to "vibrate," creating an unpleasant sensation if viewed for any length of time.

Related Hues. Related colors are usually thought of as any two or three that are immediately adjacent on the Color Wheel. As a matter of fact any group of hues are related if all have one color in common. The most obvious example would be a group of very much grayed colors; they would all have gray in common.

Related colors do not clash and are the "safest" in the hands of the novice. However, such color schemes lack color contrast, a contrast they could have if three of four colors were related and the fourth was a complement of one of the three. For instance, the related trio of green-yellow, green, and blue-green. Color contrast would be secured by using purple, red-purple, or red as the fourth color.

The closer any group of colors is to being all the same color (as variations of yellow-red and yellow) the greater the color harmony. The more distant the colors are from one another the greater the color contrast—the greatest distance being directly opposite on the Color Wheel.

These descriptions of contrasting and related colors are only part of the story, for real refinement and real art in color association are more dependent upon interesting variety in tone value and intensity contrast than in the association of the hues themselves.

Tone Value Contrast. Previous explanations have made clear the fact that colors are light and dark, and that they run the same value scale from near black to near white, with traces of color evident, just as the scale of grays runs from black to white. The "brightness" of any color is modified by any change in the volume of light under which it is viewed. The more white light the lighter the color appears in tone value.

Decrease the light volume and the color appears darker. Any object appears more nearly in its "natural" tone value under a thin overcast daylight condition. Such light brings out the object's true "local" color.

We color photographers can alter the tone value of any color area by increasing or decreasing the amount of light falling on the area, or by under- or over-exposing that particular area. Under-exposure will darken the color, over-exposure will make the result in the picture lighter. One of the most common controls is on backgrounds, for a middle value blue, for instance, will record very dark if it is under-lighted (and under-exposed); it will record about as the eye sees it if is it amply lighted and given the correct exposure; and it will record weak and high-key if over-lighted and over-exposed.

Remember that the tone value of the color areas in your subject is what determines exposure calculations.

Color Intensity Contrasts. This matter of color intensity is the most difficult color characteristic to understand. "Purity" is a more expressive word, as the following illustration will prove. Let's assume we have a pint of pure, bright red paint and some gray paint that matches the red in tone value or brightness. If we add some of the gray paint to the red we no longer have a pure red but a grayed red. Because both the red and the gray are the same tone value, we have not made the new red lighter or darker, we have merely reduced its intensity.

If we add white or black to the pure red the mixture is no longer a pure red—the intensity has been grayed or "diluted," but at the same time we have made a new red that is lighter or darker than the original pure red.

Every color is at its purest at some tone value level; yellow is purest at a high value level; red at about middle value; purple-blue at below the middle value level. That is why we call yellow a "light" color, purple-blue a "dark" color. Consequently, when any color is lighter or darker than at its natural value level it is also less intense and is no longer "pure" color.

Putting Together Pleasing Color Arrangements

1. Remember to keep the organization of objects and color orderly, without monotonous effect.
2. Get sufficient color, tone value and intensity contrast into the picture to give variety without creating confusion.
3. Use good taste. Your own sense of what is pleasing will be your final criterion. The possibilities are endless—do not be afraid to try the new and different. There is no such thing as a "bad" color—it is only the way it is used that makes it "bad" or "good."

The entire subject of color is covered comprehensively in my book "COLOR — How to See and Use It."

CHAPTER FOUR

SHOOTING COLOR BY ARTIFICIAL LIGHT

MANY color slide shooters have the mistaken notion that "professional" experience and elaborate, expensive equipment are needed to produce good color slides indoors with artificial light. Neither is true. In fact more consistently good results *can be secured* by artificial light because all conditions are controllable.

It is a different technique—not difficult, just different. Careless procedures and inadequate equipment will not produce results worth the effort. Artificial light work does require thought and care.

Several factors contribute to or detract from the making of good color slides by artificial light, in exposure or color quality, or both. Some of the more important are:

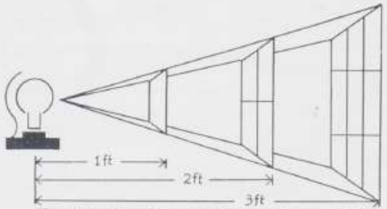
1. Type of lamp (bulb) used.
   Better to use two or more smaller ones than one large one.
2. The age and condition of lamps used.
   Photofloods emit a "warmer" light as they get older.
3. Type of reflector in which lamps are used.
   It doesn't pay to use cheap, inefficient reflectors. Standardize on one good type so this factor will be constant.
4. Condition of reflectors—new or old and dirty.
   Dirty, battered up reflectors can decrease the effective light as much as one-third to one-half.
5. The voltage at which lamps are burned.
   All lamps have a rated voltage. When burned at higher voltage the light emitted is too "cool," at lower voltage too "warm". Best check is to have a volt meter that can be inserted in the line and read with all lamps burning. This won't control the voltage but will indicate whether a filter should be used to compensate.
6. The placement of lamps to get the effect desired.
   This should be no haphazard procedure, but not difficult if the effect of each lamp is observed individually, with other lamps off during the checking.
7. Surroundings in which the subject is posed — whether in expansive or confined areas; color and reflective character of near-by walls. *This is highly important and can make the difference between a "hard light" and a "soft light" effect.*

Before considering each of these factors in some detail it might be well to establish three important characteristics that distinguish artificial light conditions from those of daylight. Remember:

1. That artificial light sources which can be used in the home are weak in volume compared with sunlight. There is never quite as much light as you think, as your meter will tell you.

→ 2. That artificial light drops off or fades away rapidly as it travels from its source, regardless of its intensity. In sunlight we have no such problem as "light-to-subject distance." For the ratio of this "fall-off" check the diagram below, and keep this general formula in mind when moving lights hither and yon. It is not scientifically accurate but sufficiently so for a guide.

A number of factors affect the apparent fall-off of artificial light as it travels from its source, but for practical purposes the rather arbitrary rule of "twice the distance, one-fourth the light", et cetera is sufficiently accurate.



(Three times the distance, 1/9th the volume of light)

The above graph demonstrates, roughly, the ratio at which artificial light spreads out and loses its "intensity" as it travels from its source. Light volume (or intensity) increases, in inverse ratio as the light source is approached.

3. That artificial light sources in circular reflectors (built-in or otherwise) throw a circular field of light having a "hot-spot" or brilliant center, with a fall-off in light toward the circumference of the circular field. Some reflectors throw a narrower beam than others but this alone does not entirely eliminate the "hot-spot."

Now for those factors that so definitely affect color results.

Type of Lamp to Be Used

First, it must be remembered that the various color films commonly used for slides (35 mm, Bantam or 120 size) are balanced for different light sources, but interchangeable with filters. By referring to the table at the top of page 5 it will be noted that the higher the degrees Kelvin the "cooler" or bluer the light; the lower the temperature at which the lamp burns the "warmer" the color of the light. The following tables indicate the light source to which each film is balanced, and the filters that make possible the interchange of these sources.

Light Sources and Film Sensitivity

FILM	LIGHT SOURCE
Type A Films (regardless of trade name)	Photoflood (about 3400 Kelvin)
Type B Films (regardless of trade name)	3200K Lamps (3200 Kelvin)
Type F Films (regardless of trade name)	Clear Flash (3800 Kelvin)

Interchanging Light Sources, with filter correction:

FILM AND LIGHT TO WHICH BALANCED	WITH THIS LIGHT SOURCE	USE FILTER
Type A—Photoflood Lamps	3200K Lamps	82A or B ⅛
Type B—3200K Lamps	Photoflood	81A or C ⅛
Type F—Clear Flash	Photoflood	82A or B ¼
Type F—Clear Flash	3200K Lamps	82C or B ½

(See Filter Table, page 84, for complete list of filters for conversion)

List of lamps suitable for use on home light circuits:

LAMP	APPROXIMATE WATTAGE	BURNING LIFE
No. 1 Photoflood	250	3 hours
No. 2 Photoflood	500	6 hours
No. 4 Photoflood	1000	10 hours
Reflector Flood RFL-2	500	6 hours
Reflector Flood (Medium Beam)	375	4 hours
Reflector Spot RSP-2	500	6 hours
3200 K Lamp No. A-23	250	25 hours
3200 K Lamp No. PS-25	500	60 hours

Unless your wiring arrangement is such that it will carry a heavier load than the average home circuit with 15 amp. fuse, a safe limit on light load is as follows:

No. and type of lamp on 1 circuit	*Total No. of lamps used*
2 No. 2 Photofloods	4 No. 2 Photofloods
2 3200 K Lamps No. PS-25 (500 watt)	4 3200 K Lamps PS-25
2 Reflector Floods RFL-2	4 Reflector Floods RFL-2
3 Reflector Floods (Medium Beam)	6 Reflector Floods (MB)
2 Reflector Spots RSP-2	4 Reflector Spots RSP-2
4 No. 1 Photofloods	8 No. 1 Photofloods
4 3200 K Lamps No. A-23 (250 watt)	8 3200 K Lamps A-23

(If there are no house lights or appliances working on the same circuit at the time you can use 3 No. 2 Floods, 6 No. 1 Floods, or equal number of corresponding wattage 3200 K Lamps on one circuit, at some risk of blowing a fuse if other load is put on the line at the time)

NOTE: The following ten pages illustrate and describe several basic lighting arrangements for indoor color shooting at home, applicable to close-up figure studies and small groups, or any subject which the lights will cover adequately. Because the light diminishes toward the edge of the field covered, place the lights to cover a larger field than the lens does. (All exposure data, pages 31-41, for Kodachrome Type A, ASA 16.) *

[illegible] TO ART.

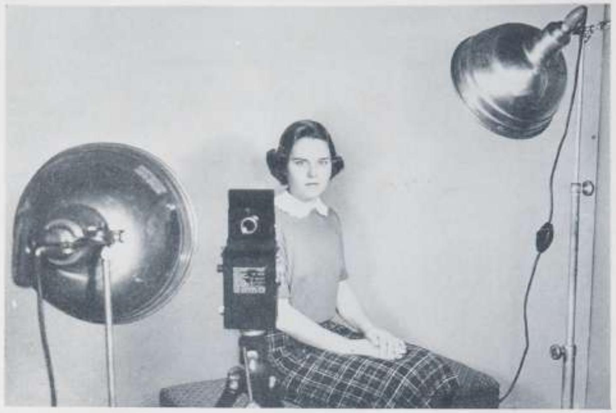
The simple lighting setup shown on page opposite gives soft modeling and full, natural color, when proper exposure is made. If hair of subject is light the head will "silhouette" against almost any background if subject is as far from background as from the camera. If hair is dark, the background should be lighted but not lighter than flesh tones. Best tone value would be half way between flesh and dark hair tones. If the background is a color, it should be "cool" and of weak intensity, to enhance the flesh tones.

BASIC TRIANGLE LIGHTING

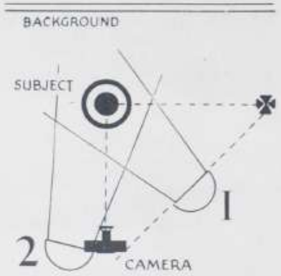
Too often lighting for informal portraits is so "flat" that the result looks very much like the old time magnesium flash light pictures of a generation ago. This Triangle Lighting setup is almost fool-proof, in that it automatically balances the light and shadow sides of faces in a ratio of approximately 2 to 1, ideal for color. It permits an exposure that will render flesh tones solidly and with good color throughout, devoid of harsh shadows or strong contrasts. And such lighting makes correct exposure relatively easy to determine, either from tables or by light meter readings. Keep the fill-in or front light (2) close to camera axis and on opposite side from the Key light, otherwise it will not properly illuminate the shadows cast by the Key light. See opposite page.

Meter readings of Eastman Neutral Test Card are very accurate for average flesh tones.

I suggest that beginners become proficient with this lighting arrangement before attempting more complicated setups.



The Key Light (1) is placed in the center of the hypotenuse of an equilateral triangle, the "X" point being the same distance from subject as Front Light (2) and camera are from subject. Better modeling and more natural lighting is secured when the Key Light (1) is higher than the subject, with the Front Light (2) about level with subject, to illuminate chin, nose and eye shadows. To maintain the approximate lighting ratio of 2 to 1, both lamps must be the same size and in same type of reflectors. For more contrasty, "effect" shots Key Light can be moved closer or the front light moved farther from the subject.



EXPOSURE GUIDE FOR TRIANGLE LIGHTING
KODACHROME TYPE A

Distance—Lights to Subject		No. 2 Photofloods in Standard 10" Matte Finish Reflectors		
FRONT LIGHT (2)	KEY LIGHT (1)	1/10 sec. Shutter	1/25 sec.	1/50 sec.
5 ft.	3½ ft.	f/8	f/5	f/3.5
7 ft.	5 ft.	f/5.6	f/3.5	f/2.5
9 ft.	6¼ ft.	f/4.5	f/2.8	f/2.0

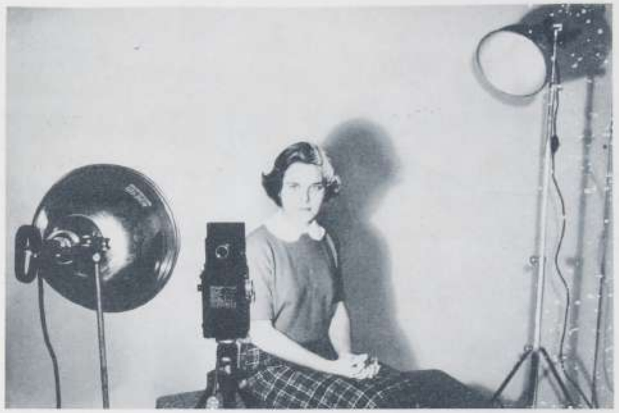
NOTE: If subject is close-up of a figure and light is reflected from white or light toned nearby walls, use ⅓ f/stop less than above.

This type of lighting pulls a figure study away from the background because of the sharp contrast between the highlighted accent on head and shoulders and the background, provided the background gets light only from the front light at camera position. The amount of contrast will depend upon distance of accent light from subject, distance of subject from the background, and distance of front light from background. Also upon the background's natural tone values.

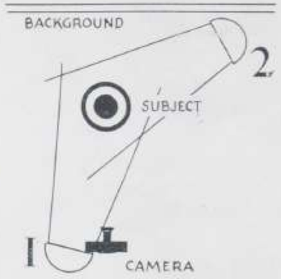
FRONT LIGHT WITH BACK ACCENT LIGHT

Flat, front lighting alone makes a subject look "flat." Figures lack modeling and there is little feeling of three dimensional quality. That is the way the above head study would have looked without the back accent light shown in the setup on the opposite page. The back light, for greatest accent and contrast, should be closer to the subject than is the front light, but not closer than half the distance from front light to subject—one-third closer would be better. The height of this Back Accent Light, in relation to the subject, will also influence the modeling on the planes facing the camera, as a little experimenting will prove. In setting up this light arrangement, determine at what distance you want subject from camera, set the Front or Key Light (1), then alter position of Accent Light (2) to get effect desired; move sideways as well as up and down.

This lighting arrangement need not be limited to one front light, but this shows what can be done with only two lights. The back accent light can be used with any setup.



This lighting arrangement produces the modeling shown in the head study on the opposite page. The Key Light (1) is at or near the camera. Exposure is based on this Key Light only except in extreme effect shots. This Key Light (1) can be higher or lower than camera—higher will give slight eye, nose and chin shadows. Or this Key Light can be closer or farther from subject than the camera, but distance of light to subject, not camera to subject, determines exposure. Make light readings with Accent Light (2) turned off. For "back-lighted effect" shots bring Back Accent Light (2) to one-half the distance that Key Light is from subject, then cut exposure 1 f/stop less than Key Light calls for.



EXPOSURE GUIDE FOR FRONT AND BACK ACCENT LIGHTING
KODACHROME TYPE A

Distance—Lights to Subject		No. 2 Photofloods in Standard 10″ Matte Finish Reflectors		
FRONT LIGHT (1)	BACK LIGHT (2)	1/10 sec. Shutter	1/25 sec.	1/50 sec.
3½ ft.	2½ ft.	f/7	f/4.5	f/3.2
5 ft.	4 ft.	f/5	f/3.2	f/2.2
6¼ ft.	4 ft.	f/4	f/2.5	f/1.8

NOTE: If subject is close-up of figure and light is reflected from white or light toned nearby walls, use ½ f/stop less than above.

Subject: "AND NO PLACE TO GO"

Photographer: CLIFFORD E. MATTESON, WILLIAMSVILLE, NEW YORK

Film Used: Kodachrome Type A
Exposure: 1/10 second @ f/6.3
Camera: 4x5 Crown Graphic with Bantam Adapter
Filter: None
Lens: 135mm Optar f/4.7
Light: One 750w Spot, Three 500w Photofloods

Mr. Matteson comments: "The little girl is my daughter Barbara. Being a first child and having an amateur photographer for a father she has gone through the ordeal of having her picture taken times without number. Up to the time this picture was taken (about 5½ years) she had been a cooperative model, but about this time she became a little weary and suffered from a lack of patience, so this shot was a natural, for the look of discouragement came easily. The original intention was to have a portrait of her in her new outfit, but upon seeing the cooperation I decided to have her hold her head in her hands and look as though the plans had been changed after getting ready to go away."

In addition to the pleasing, simple color, the good lighting and the quality of the flesh tones, I am impressed with the fact that this shot contains everything needed to tell the story, and there isn't a superfluous element in it. The masses fill the frame in interesting fashion, and all directional lines keep the eye within the picture. The color association is good and although rather strong in intensity, it doesn't detract from the flesh tones. The repetition of red, in the hat tie strings is good, and the background goes back and is unobtrusive, as backgrounds should be.

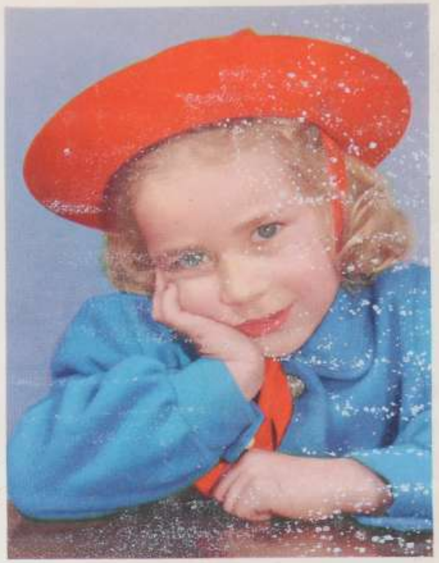
Subject: "WHITE BLUSHING GOLD"

Photographer: HAL KEENEY, JOHNSON CITY, NEW YORK

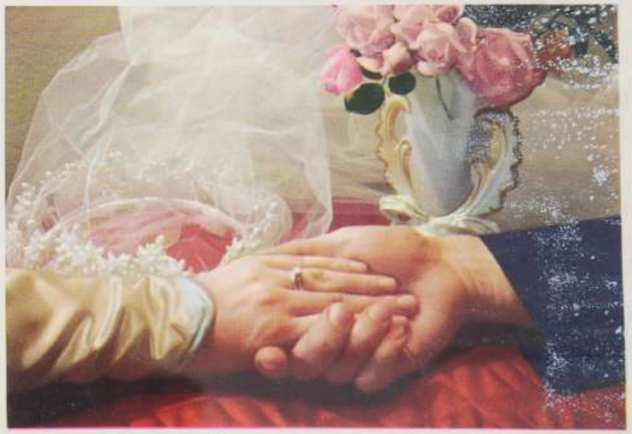
Film Used: Kodachrome Type A
Exposure: 8 seconds @ f/22
Camera: Kodak "Pony 828"
Filter: None
Lens: 51mm Kodak Anaston f/4.5
Light: Two 60w ordinary tungsten house lamps

Mr. Keeney writes: "This transparency is one of my first—I have been working in color but a short time. From previous shots of hands I found the flesh tones lacking in warmth and texture. So the use of the two 60w ordinary tungsten lamps was strictly an experiment. . . . The picture was conceived, setup and shot within an hour one Sunday afternoon, soon after my wife and I were married. Needless to say, my wife was my inspiration, for it was her hand in mine in the shot. I took the shot by using a three foot cable release. . . . I used a small lens opening to facilitate the depth of field. . . . One lamp was used at camera level, at the right, the other high, closer in, and to the left."

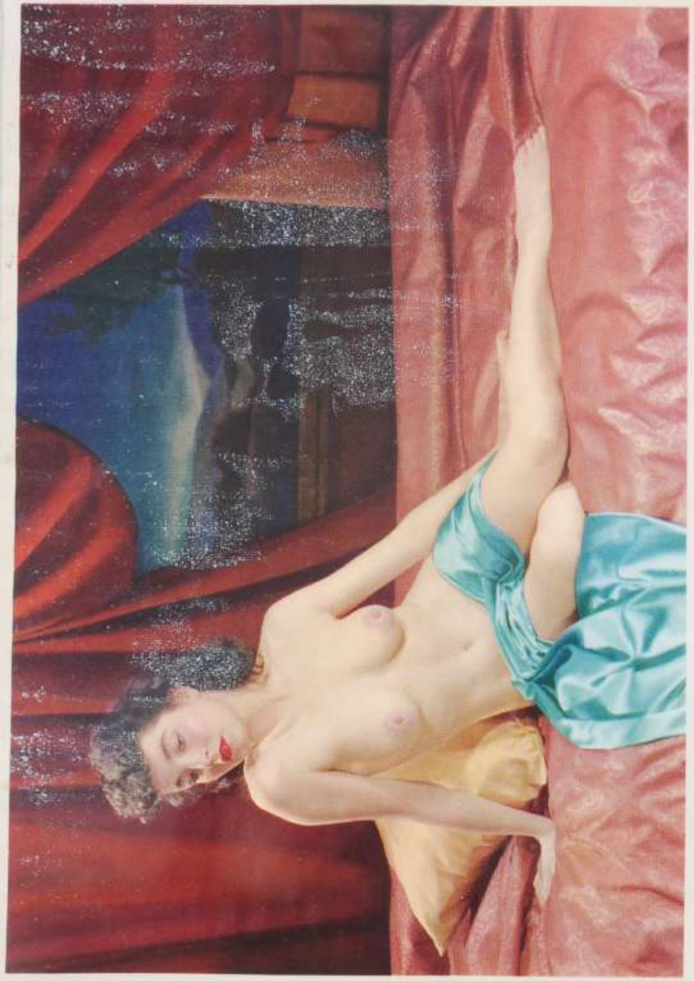
This shot seems satisfying because of its simplicity in telling a story every one can understand. The elements are well placed, and none are superfluous. The color quality of the flesh does not show the excessive warmth one might expect with light sources that were at least 400° Kelvin warmer than that for which the film is balanced.



"AND NO PLACE TO GO"
CLIFFORD E. MATTESON



"WHITE BLUSHING GOLD" HAL KEENEY



A Nude Study To Simulate an Old Painting

Too many nude figure studies turn out to be merely a picture of a naked human form. The environment in which a figure is placed can do much to help create an artistic and pleasing result. In planning this shot we did what I suggest you do—study paintings of the old masters. From one we got an idea for background; from another, a suggestion as to pose; from still another, a general light effect. None were followed literally; the problem was to combine the ideas in pleasing association.

Composition. The figure was posed to fit the horizontal format. The background drapes were arranged to continue and repeat the sweeping lines of the figure. This was first all worked out in rough sketches.

Color Composition. It was decided that all large areas should be warm colors; cool ones might set up too much color contrast with the flesh tones, and they definitely would if they were too intense. Colors selected were all darker than the flesh tones, for value contrast. To add sparkle and hue contrast, some complementary color was needed, hence the dull blues in the suggested scene, and the more intense blue draped over the figure—used both as color accent and to accentuate the sculptural form of the figure.

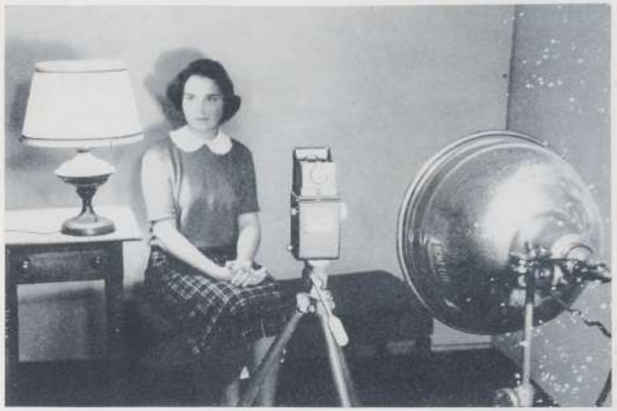
Lighting. Four 500w 3200 K lamps, arranged to suggest natural room light; lights partially shielded to subdue the amount reaching the background; the main (closest) light was concentrated on the figure; accent light from the left was used to add sculptural effect to the figure, as well as to suggest a second room light.

The very simple lighting arrangement shown on the opposite page produced the simulation of ordinary home lighting which is evident in this head study. One of the common disadvantages of Artificial Light color shooting is that the lighting looks "artificial" — too much like stage lighting. This simulation of home light effect can be employed only when a single figure is the subject because the light in the house lamp is dissipated — there is no reflector to direct the light toward the subject, and any lamp shade that is opaque enough to hide the bulb absorbs much of the otherwise usable light. The color shot on page 88 was made with a light arrangement similar to that shown opposite.

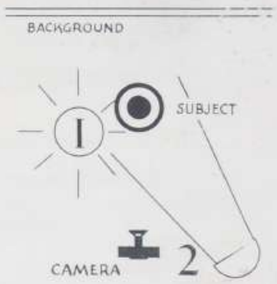
SIMULATING ORDINARY HOME LIGHTING

Do you often wish you could take indoor color shots of the family or friends just as you see them under the soft glow of a table lamp? It can be done, but it involves certain factors that make proper exposure somewhat more difficult. Perhaps it would be best to say that exposure is more difficult unless accurate light readings are made. No exposure table can be too exact for the opacity of the lamp shade will have much to do with the volume of light reaching the subject. And to get the proper effect the Front Light (2) must be at a distance from the subject so that planes facing the camera have ample light for good color, but not so much that this light will equal that of the light from the Table Lamp (1)—that would spoil the effect of natural room illumination. A final reminder—the lamp shade must be white if you wish true flesh tones.

There are all sorts of variations of this light effect, and many of them can be secured by placing the main light higher or lower, and by changing the head position in relation to the light.



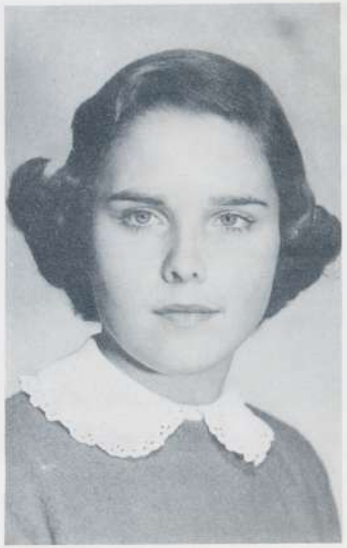
As the above setup shows, the Key Light (1) is a No. 2 Photoflood in an ordinary table lamp which had a white cloth shade, but with overlapping folds that made, in effect, double thickness of the material. Because so much of such scattered light is lost, this lamp, the Key Light, must be rather close to the figure. Also, this Key Light must be slightly forward of the subject so that it will properly illuminate planes facing the camera. The Front Light (2) should, for proper effect, be a distance from the subject so that a light reading with this light on and Key Light off will be somewhat less than half that of a reading of the Key Light alone. As the table below shows, this Front Light (2) had to be moved back from the subject to a distance of 7 feet, while the Key Light (1) or table lamp was only 18 inches from the subject.



EXPOSURE TABLE FOR ABOVE LIGHTING ARRANGEMENT
KODACHROME TYPE A

Distance—Lights to Subject		No. 2 Photofloods, Key Light in table lamp, other in reflector		
KEY LIGHT (1)	FRONT LIGHT (2)	1/10 sec. Shutter	1/25 sec.	1/50 sec.
18 inches	7 ft.	f/6.3	f/4	f/2.8
27 inches	9 ft.	f/4.5	f/2.8	f/2

NOTE: The exposures suggested above will produce a very effective result if a semi-transparent shade is used on the table lamp. Best results will be secured if exposure is based on accurate light meter readings.

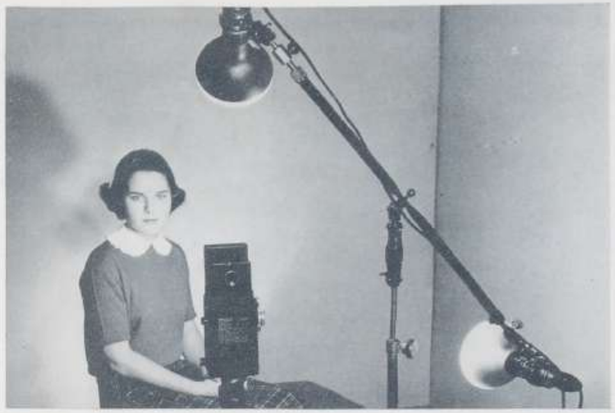


The modeling on this head study was produced by front lighting, but not the typical flat front light that results in a "flat," two dimensional effect. The modified front lighting was created with the twin front lights shown on the opposite page—a simple arrangement with very simple equipment, that can be varied to create many slight modifications of the result indicated by this study. There is little excuse for using flat, front light when all of the advantages can be gained with such slight change, and most of the disadvantages as easily eliminated. Although a background light was used on this shot it would not be necessary if the background was a light tone and got sufficient illumination from the front lights so that head would "silhouette" pleasingly.

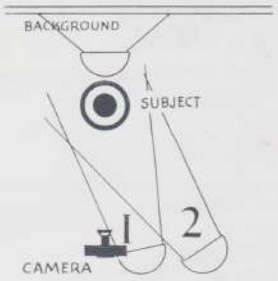
USING TWIN FRONT LIGHTS

As remarked many times previously, there are so many disadvantages in using flat, front light that any method that retains the advantage of full light on the subject and still creates some roundness and third dimensional effect is much to be desired. Too often when twin front lights are used they "straddle" the camera, balancing the light on the subject evenly and thereby creating "flatness." Portable equipment that mounts the camera between two lights is indispensable when it is necessary to change positions quickly (candid shots), but in that case everything must be subordinated to the problem of keeping full light on the subject and following the subject as it moves about. When the subject stays within the full coverage of stationary lights, the setup shown opposite or some modification of triangle lighting is best.

Refer to the effect of Triangle light (page 30) and note that this setup produces somewhat the same modeling, although this arrangement is not as flexible in use. The principal point is—do not use the camera in the center, between the lights, as is often done in movies.



The lighting arrangement above produced the modeling shown on the head study on the opposite page. It is front lighting, but with some variation. The lamps are Reflectorfloods mounted on a crossarm made for the purpose, which attaches to any standard light stand. Although both lamps are in the same plane and are at right angles to the camera axis, by tilting the cross arm as shown, and having the Top Light (1) almost directly over the camera and the Bottom Light (2) low, an effect of roundness is created that cannot be secured when twin lights either straddle the camera or are placed close together (at same level) near the camera. Light readings should be made with both lights on and both lights directed fully on the subject.



EXPOSURE GUIDE FOR TWIN FRONT LIGHTS
KODACHROME TYPE A

Distance—Lights to Subject	No. R2 Reflectorfloods		
TWIN LIGHTS (1) and (2)	1/10 sec. Shutter	1/25 sec.	1/50 sec.
3½ ft.	f/10	f/6.3	f/4.5
5 ft.	f/7	f/4.5	f/3.2
7 ft.	f/5.6	f/3.5	f/2.5

NOTE: If subject is close-up of figure and light is reflected from white or light toned nearby walls, use ⅓ f/stop less than above.

Variations in Light Placement

The four simple lighting diagrams illustrated on the preceding pages are only suggested beginnings in the endless variety of lighting arrangements. Most of the confusion about highlights and shadows—main or modeling light sources versus fill-in lights and such will be dispelled if the photographer will think in terms of outdoor lighting. Think of the modeling light as the sun and fill-in light as a reflector.

Let's consider the effect of the modeling light for a moment. If this light is close to the subject and too high it will create highlights and shadows similar to those under a noon-day sun—strong shadows in eye sockets, under nose and chin. If the modeling light is on a level with the subject the effect will be similar to that produced by the very flat light of the sun very early or late in the day. Variations between these two extremes will produce any modeling desired.

Once you have determined the placement of the modeling light handle the fill-in light or lights as you would a reflector, to throw the desired amount of light into the shadow areas created by the modeling light. As we are most concerned about the shadows on surfaces or planes facing the camera, the fill-in should be near the camera axis.

To add highlight accents on hair or to sharply outline the side of a face with back-lighting, place these lights close enough so they will throw more light on the small area they cover than the modeling light throws on the subject. These accents, to appear as accents, must be over-exposed in the final result, if only as much as ½ f/stop.

Properly lighted indoor color shots require thought and judgement more than they do rigid rules. Frankly, I get a little bored with the "professional" approach to such problems, as though there is some magic formula. There can be just as much variety in artificial lighting as in outdoor lighting. Remember four basic "rules":

1. There should be one principal light source. That is your improvised "sun."

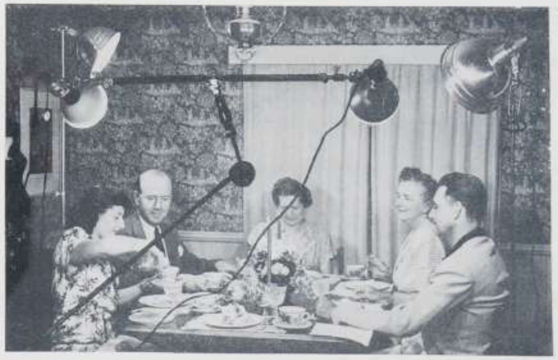
2. There should be at least one fill-in light to illuminate shadows, just as most close-up outdoor shots require.

3. The third light (or lights) are for effect—such as accents on hair or portions of a figure.

4. Background light, if wanted. This is the one departure from outdoor requirements, but even it is optional.

Place or set up the lights in the order just listed. When you have determined where you want the modeling light then try the fill-in light at various positions until desired effect is secured. Avoid the objectionable double shadows around the subject's features, most likely caused when fill-in light is too far from the camera axis and on opposite side from modeling light. Next add the accent light, if any, and last, the background lighting if such is required or desired.

Triangle lighting was used for this shot, but helped greatly by the diffused, reflected light from walls and ceiling. Pictures taken in small rooms that have light toned walls and ceiling will be more evenly lighted because the walls and ceiling catch and reflect back much light that would otherwise be lost.



In group lighting the principal problem is to get even distribution of light over the entire area covered by the lens. Figures twice as far from the front lights will get only one-fourth as much light, and will be badly under-exposed. In this setup, Reflectorfloods were used as Twin Front Lights, with Photofloods (No. 2's) in reflectors at the sides. Camera position was directly under the front lights, in making the color shot, and was cropped (or framed) to exclude the side lights.

Light Output

There is much confusing information about the "volume" output of artificial light sources. Numerous comparative tests with Photofloods, Reflector Floods, Reflector Spots and 3200 K Lamps, used in identical reflectors under identical conditions (built-in types not in reflectors, of course) show the following results, using a regular No. 2 Photoflood as the standard for comparison:

In comparison with a No. 2 Photoflood in 10-inch matte finish aluminum reflector

LAMP		f/ STOP VARIATION
Reflector Flood RFL-2	permits an exposure of	1/3 f/stop less
Reflector Flood (medium beam)	permits an exposure of	2/3 f/stop less
Reflector Spot RSP-2*	permits an exposure of	2½ f/stops less
3200 K Lamp (500 watt)**	requires an exposure of	1/5 f/stop more
No. 1 Photoflood	requires an exposure of	2/3 f/stop more
3200 K Lamp (250 watt)**	requires an exposure of	1 f/stop more

*Should not be used as principal light source except for "effect" shots.

**If used with a Type A film the filter requires an additional 1/3 f/stop. This may be offset by moving lights 1/5th to ¼th closer to subject.

In Kodaflectors, using polished side

No. 1 Photoflood gives slightly more light output than a No. 2 in matte reflector

3200 K Lamp (250 watt) gives slightly more light output than a No. 2 in matte reflector

The above table is presented *only* to give you a basis for exposure calculations when light-to-subject distance tables are used instead of a light meter. With all due respect to such exposure tables they are not dependable for critical work; there are too many variables such tables cannot take into account. Use a meter. Better safe than sorry.

Light Diminishes Toward "Rim" of Field Covered

Readily noticeable or not, the light thrown by a parabolic reflector is "hotter" in the center than toward the edges of the circular field the light covers. This is not a "hot spot" in the sense that a spot light throws, but even with the most efficient reflectors the "volume" of light 15° right or left of "center" is only about 90% of that at the center, and at 22½° right or left it is only about 70% of the amount of light in the center of the light field. Inefficient reflectors will produce a more rapid fall off in light from the center of light field to the rim.

Determining Exposure by Artificial Light

There are two ways to determine exposure—rigidly follow exposure tables or carefully check the scene with a light meter.

In using tables, base exposure on lamp-to-subject distance of the KEY LIGHT, not on fill-in lights. If the subject is flat-lighted with two lights (as in the illustration with twin front lights) be sure to reduce diaphragm opening about ⅔ f/stop smaller than for a single light. Further, in using tables, it is safest to have fill-in lights (of same wattage as Key Light) not more than 50% farther from the subject than is the key or modeling light. Make no allowance for back or accent lights if they are only that.

BASIC EXPOSURE TABLE—TYPE A KODACHROME, ASA 16—PHOTOFLOOD LAMPS

Lamp-to-Subject distance (modeling light) for two No. 2 Photofloods or 2 Reflector Floods, "Triangle" lighting setup page 31, lamps in 10" matte aluminum reflectors

Shutter Speed	f/2	f/2.8	f/3.5	f/4	f/4.5	f/5	f/5.6
1/5	23 ft	10 ft	13½ ft	11¼ ft	9 ft	8½ ft	7½ ft
1/10	17 ft	11¼ ft	7¾ ft	7¼ ft	6½ ft	5½ ft	5 ft
1/25	10 ft	6¼ ft	5 ft	4½ ft	4 ft	3½ ft	3 ft

(The above table was computed from Weston readings on the Eastman Gray Neutral Test Card. For subjects "lighter" than average use ½ f/stop less, for "darker" use ½ f/stop more.)

Convert above table as follows: For films with speed of ASA 12 use 1/3 f/stop larger than above; film speed ASA 25 use 2/3 f/stop smaller; film speed ASA 100 use 2-2/3 f/stops smaller; film speed ASA 125 use 3 f/stops smaller.

Incident Light Meter Readings

In "Triangle" lighting setups such as shown on page 31, first read the volume of the key or modeling light, with meter held at the subject and pointed directly at that light. Then turn off this light, turn on the fill-in light (in this case the one at the camera) and make a reading of that light with meter held at the subject and pointed at the camera. This fill-in light should call for one f/stop *more* exposure than did the reading from the modeling light. That means a lighting ratio of 2 to 1, good for color portraits. Now turn on both lights, take the reading of the combined lights and base your exposure accordingly, making allowance for subjects darker or lighter than average. Incident Light Meters are preferred by many for artificial light work because with such a meter one can easily repeat any lighting arrangement—merely move lights until total volume reads as desired.

Reflected Light Meter Readings

Use such meters as you do outdoors, and be sure to check several representative tone value areas in the subject, to determine the contrast range from lightest to darkest. If flesh tones are to be rendered properly some areas may require more or less light, to bring them into proper exposure range with readings on the flesh.

The Eastman Neutral Test Card (gray side) is an excellent device for checking the relative amount of light falling on various areas of the subject. Hold the card directly in front of such areas and make readings from it for a sure check on the amount of light present. On average subjects exposure can often be based on these card readings if card is held in same plane as subject, and directly facing the camera. Such readings are about that from average flesh. Once you learn to use this card for setting up your lights, you will hesitate to work without it.

The Exposure Value System

This System employs a series of 17 Light Value Numbers ranging from 2 to 18, as shown on chart below. Each number represents all the combinations of shutter speed and f/stop that will produce the same exposure. Each EV number's series of shutter-f/stop settings produces double the exposure of the next higher EV number, or vice versa.

In cameras equipped with EV controls the shutter and diaphragm are mechanically linked. The EV ring is set at the number indicated by a light meter or data with the film. When the operator sets the shutter speed the diaphragm is automatically set at the proper f/stop, or he can select the f/stop and this adjusts the proper shutter speed. For ½ f/stop variations the EV ring is set halfway between the numbers. Shutter speed remains at one of the regular speeds but the diaphragm adjusts to halfway between full f/stops.

SHUTTER SPEED AND LENS OPENING EQUIVALENTS OF EXPOSURE-VALUE NUMBERS

Exposure-Value Numbers	f/numbers							
	2	2.8	4	5.6	8	11	16	22
2	1							
3	1/2	1						
4	1/4	1/2	1					
5	1/8	1/4	1/2	1				
6	1/15	1/8	1/4	1/2	1			
7	1/30	1/15	1/8	1/4	1/2	1		
8	1/60	1/30	1/15	1/8	1/4	1/2	1	
9	1/125	1/60	1/30	1/15	1/8	1/4	1/2	1
10	1/250	1/125	1/60	1/30	1/15	1/8	1/4	1/2
11	1/500	1/250	1/125	1/60	1/30	1/15	1/8	1/4
12		1/500	1/250	1/125	1/60	1/30	1/15	1/8
13			1/500	1/250	1/125	1/60	1/30	1/15
14				1/500	1/250	1/125	1/60	1/30
15					1/500	1/250	1/125	1/60
16						1/500	1/250	1/125
17							1/500	1/250
18								1/500

SHUTTER SPEEDS

CHAPTER FIVE

FLASH - REFLECTED - BOUNCE - AND BARE

The popularity of flash for color slides has been given considerable impetus by the number of flash-type color films now available and the introduction of power-packed miniature flashlamps.

Flash is a dependable light source with several advantages—volume of light, compared to floods—ease of exposure determination, by guide number—and instantaneous exposure, to stop action. Although this discussion is concerned with flash bulbs most of the procedures can be duplicated with electronic flash, within the limits of its light output.

There are three general approaches to flash photography. First, flash on camera—second, single flash at other than camera position—third, two or more flashlamps used in a variety of placements as suggested for photoflood illumination on pages 30 to 43.

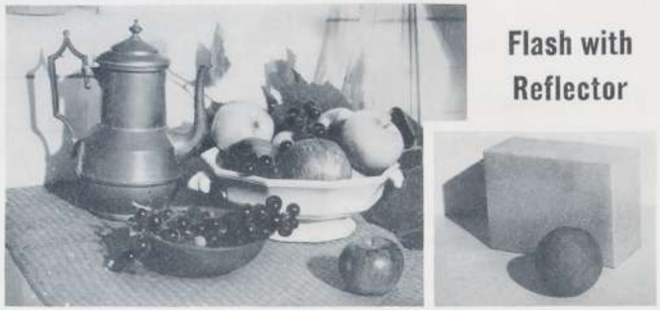
Flash on Camera

This procedure has many limitations. It produces a "flat" light with little or no modeling of the subject. Camera-to-subject distance is too often dictated by the necessary flash-to-subject distance called for by the flash lamp guide number, and that may not be the best combination of f/stop and image size. Flash on camera is too inflexible for the serious slide maker but it is a boon for the snap-shooter with a simple, inexpensive camera. But let us investigate the greater possibilities of more effective techniques.

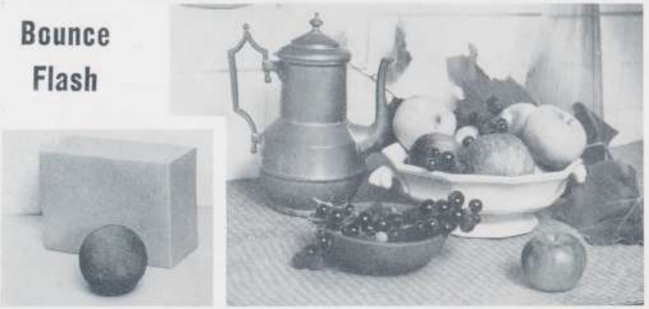
Single Flash-off Camera

Single flash used off the camera offers even more variety of light angles than one can secure by placing a figure in different positions in relation to the sun. And one can control both light volume and light quality with flash.

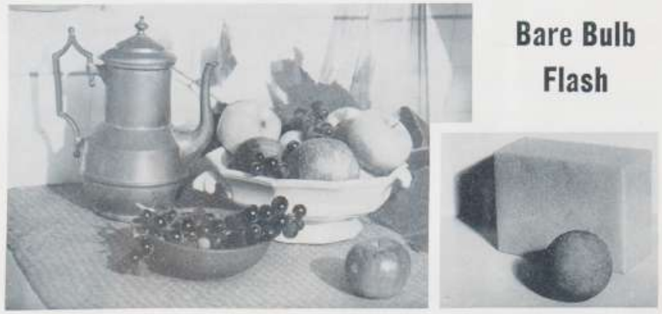
The illustrations on the next four pages demonstrate three types of flash illumination. There are, of course, many variations of each, such as height of flash and angle in relation to camera position. Type of reflector and its condition affects both the volume of light and the quality of light from any flash lamp. A highly polished, fully parabolic shape reflects a "sharper," more concentrated light. A flatter, matte finish reflector gives a greater spread of light, and a softer light. A diffuser over flash will create a still softer light, with less volume.



Flash with Reflector

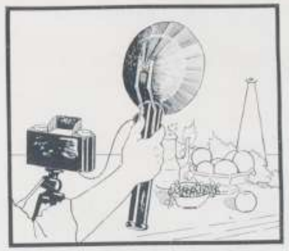


Bounce Flash



Bare Bulb Flash

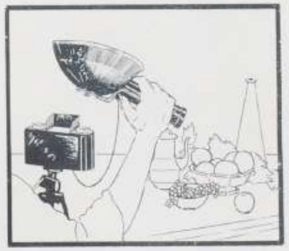
One Flash, in Reflector—off Camera



The flash for this shot was higher than indicated in this diagram, and more to the right of the camera. Check the shadows for direction of the light. Flash on camera would have produced a "flat" look in the color result. Even though there may be color separation between objects in a subject, a feeling of form can be secured only when the light source is placed to produce some shadows. This still life has a white tile background to sharpen the shadows.

Exposure was based on flashlamp guide number. Flash in highly polished reflector.

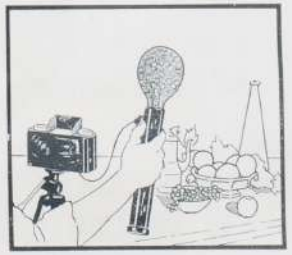
Bounce Flash—bounce from ceiling



The illustration on the opposite page is devoid of strong shadows. Even though the shadows are soft and diffused the light still has direction. The flash was held at the same position as for the shot above but it was directed at the ceiling, about halfway between straight overhead and the subject. With reflected light the angle of incidence is the angle of reflection. If the flash is shot straight overhead or slightly back of that the light is diffused still more.

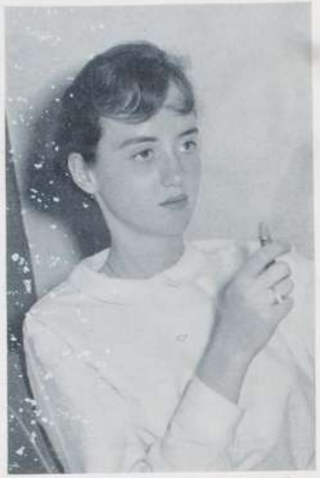
Exposure was 1½ f/stop larger than for the direct flash shot.

Bare-Bulb Flash—no reflector



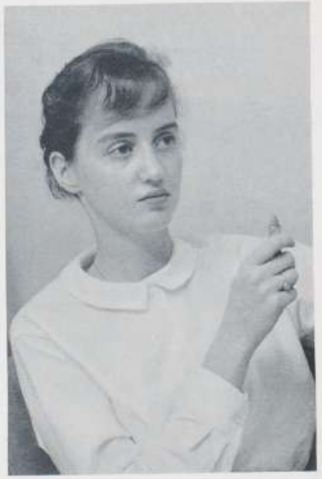
There is little to be gained with bare-bulb flash although the light is not quite as hard as with a reflector, as the shadows show. The diffusion or scatter produces somewhat the same quality as a thin diffuser over reflector. The one advantage is that bare-bulb flash floods a room with light. All objects covered, even with a wide-angle lens (at same distance from the flash), will be well exposed.

Because the light was not reflected toward the subject this shot required 1 f/stop more exposure than did the shot with reflector.



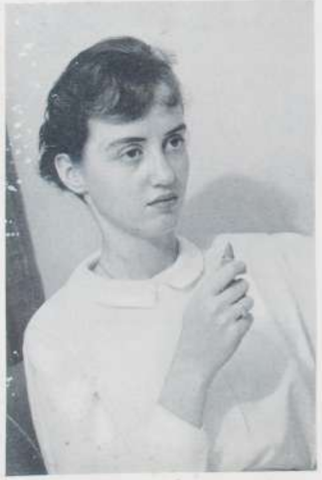
(at left)

Flash in Reflector –on Camera



(above)

Flash Bounced off White Ceiling



(at left)

Bare-Bulb Flash –high and to left

Flash in Reflector—on camera

First, let me make clear that the three pictures on the opposite page are to demonstrate the difference in effect under three types of flash illumination, and not how to pose a figure. The seemingly awkward hand was posed as it is to indicate shadow on figure. The top picture emphasizes the disadvantages of flash on camera, which blasts a hard light squarely at the figure. In this shot I used a matte-finish reflector to soften the light somewhat, and the shot was exposed to give sufficient density in the flesh tones. Such shots usually look flat and "burned out." The hard shadow behind the head could have been softened by moving the figure forward from the wall. In that case the wall tone would have been darker, being farther from the flash.

Flash Bounced off White Ceiling

For this shot the flash was in a reflector, of course, and the light shot straight up against the ceiling—the flash being about two feet below the ceiling and at a point about halfway between the camera and the figure. Modeling on the face would have been more pronounced if the flash had been only slightly in front of the figure—less pronounced if it had been shot at the ceiling directly over the camera. This is an excellent light for figure, portrait or group shots in color. Exposure for this shot was at one f/stop larger than guide number of the flash bulb used called for. Distance of flash from ceiling and the reflective characteristics of the ceiling affect exposure. Never shoot bounce flash against a very dark or strong colored ceiling.

Bare-Bulb Flash—high and to left

At first glance the modeling on this face seems much like that on the one exposed by bounce flash. Upon closer examination one sees more contrast and a harder feel. Note the sharper shadow along and under the nose and the chin shadow on the neck. The shadow from the hand and from the head indicates that the light was high (about 2 feet above top of head) and to the left of the camera. Even though this is a less desirable light for portraits than is bounce flash it is a great improvement over flash in reflector at camera. This exposure was only one-half f/stop more than for shot with flash at camera because the light was much closer to the figure. When experimenting with this type of lighting, or bounce flash, make three exposures, one at what you calculate to be the proper exposure, then one ½ f/stop larger, and one ½ f/stop smaller.

Determining Exposures with Flash

Every flash bulb or electronic flash unit has a guide number for each of various film speeds. This number is divided by the flash-to-subject distance to determine the f/stop, or is divided by the f/stop to determine correct flash-to-subject distance. However, guide numbers differ for various shutter speeds. The guide number for a No. 5 bulb with Kodachrome Type "F" at 1/25 sec. is 95 but only 60 at 1/200 sec. The slower shutter captures all the light output as most flash duration is about 1/25 sec., peak of flash is about 1/50 sec. A faster shutter is open for only a portion of the flash duration. There is no such problem with electronic flash, properly synchronized, because of the extremely short duration of the flash.

If the guide number specified by the manufacturer differs from that in the data sheet with the color film follow the data with the film.

Test Your Own Equipment

Most amateurs hesitate to "waste" film on test shots, but testing flash equipment may save much film later. A good test target is a large gray card on which are mounted a half-dozen swatches of colored paper (leaving a gray border around each)—one each of white, black, yellow, red, green and blue, none too dark. Follow the guide number given for the bulb or electronic unit and make a shot at f/4.5 at proper distance. Then expose a shot at ½ f/stop larger and one at ½ f/stop smaller. Repeat the test at f/8, at proper distance. Compare the processed film with the target. If the ½ f/stop *over* or *under* "correct" exposure produced the best rendition of the target make that compensation on future shots, or work out new guide numbers for your equipment.

A Few Suggestions

Flash for color photography can produce quality equal to that with other artificial light. . . . Avoid use of single flash *on* camera. . . . A single flash *off* camera, higher and slightly to one side, is better—but better yet when a fill light is also used (triangle lighting). . . . When shooting a group, place the flash high to equalize distance between near and far figures and turn the reflector toward the most distant figures. This will "feather" or reduce light falling on closest figure. . . . Bounce light equalizes the light over a large area without the fall-off problem with a single light source. . . . To record room lights, flames in fireplace or Christmas tree lights, use time exposure of three to ten seconds, then fire the flash for general illumination of the scene. . . . On every flash shot be sure that the flash will not be reflected in a mirror or window.

CHAPTER SIX

CHILDREN AND PETS IN COLOR

If you have children or pets of your own they are probably your favorite subjects for color slides, and because of the close association, you are able to take advantage of those sudden opportunities for many rare shots.

Those of you who do not have such subjects at hand (if not under foot) have more of a problem in handling the subject, especially if you and the subject are not well acquainted nor sufficiently accustomed to each other so there is a mutual "acceptance" and an easy association.

If you are a parent or the owner of a prize pet, and you have been successfully shooting your favorite subject in color, you have probably worked out your own techniques through trial and error (and some exercise of patience). If you have developed better methods than I suggest, stay with your own procedures. These remarks are directed primarily at the beginner with this type of subject.

From my observation and experience the most fascinating pictures of children are those of ones between the ages of six months and three years. Shots of very young babies are usually no more than records—the infant hasn't yet reached the stage where he can really put on a "show". Beyond the age of three years most children tend to be self-conscious and as a result "freeze" a pose. They lack the naturalness of earlier years. If the subjects are your own children and you have been photographing them since infancy, they may be less "stagey" than when photographed by a comparative stranger.

If you are working with a young child, the first step is to let the subject become thoroughly acquainted with the equipment. Don't try to get those prize "natural" shots until the child has all but lost interest in all the gadgets and in what you are attempting to do. This preliminary getting acquainted period is all important if you are to get a pose other than that of the child staring at you or at the equipment.

The most compelling child pictures are those caught at the peak of some expression—concentrated interest—laughing—crying—any one of a thousand attitudes and expressions that can seldom be forced or posed. Let the child be himself and do what he wants to do. He will anyway.

It is usually best to amuse the very young child with things with which he is familiar, and likes. The sudden introduction of a new toy will more often than not merely delay proceedings while the child examines it in a serious, static mood.

If you have tried working with very small children you have already discovered that it is wise to place the subject in some "confined" area or in some surroundings so that he cannot get out of range of your equipment easily. The illustrations on this page show two rather typical methods of "confinement" of the subject.

Study these shots and the data on lighting. Nothing complicated about any of them.

"CHIPPER" AT 4½ YEARS
Film, Anscochrome Tungsten. *Light*, two 500 watt 3200 K lamps. *Exposure*, 1/10 @ f/6.3.

Both shots by TED BOKOR

"CHIPPER" AT 3 YEARS
Film, Anscochrome Tungsten. *Light*, two No. 2 Photofloods, UV 15 filter. *Exposure*, 1/10 @ f/6.3.

Although I would have been inclined to use synchronized flash for all these shots, the results demonstrate what one can do with equipment and light conditions with which he is familiar and in which he has confidence. It is often a mistake to attempt to follow rigid rules—work with what fits the situation and with what you feel will give you the best results, within the limitations imposed by equipment and conditions. Handling the equipment should be automatic.

"THE DUCHESS"

In temperament, this Bond family cat is true to her name. A few nights before making this shot I tried for three hours to pose her in surroundings I selected. No picture. This pose on the mantle was her idea, and she held it long enough for several pictures. *Exposure*, by two clear flash, C ¼ filter, triangle lighting, on Kodachrome "A."

Equipment Should Be Easily Portable

As you well know, neither a child nor a pet is a "still-life" subject, a fact that all but rules out a tripod unless the subject can be confined, as in a high chair, and even then it will be difficult to get the framing you want *at the time of exposure*. A reflex camera on a tripod with a panoram head is probably the most adaptable tripod mounted equipment, although the same method can be used with other cameras.

Since you will have to shoot at 1/50 second or faster to stop action on close-up shots, accurate focusing is of first importance for you will be working at a rather large f/stop on indoor shots, which means a shallower depth of field than when a smaller diaphragm opening can be used. Focus sharply on the *front* planes of the subject, or the eyes. Use newspaper headlines or some such to focus on, to be doubly sure of sharpness. Remember that more of the subject *back* of the plane focused upon will be sharp than areas in front of this plane; roughly, twice as far back as forward from it. A good general rule to keep in mind. (See chapter on Lenses for actual Depth of Field.)

I hesitate to suggest specific equipment, because equipment alone is seldom the sole solution to any picture problem, but in shooting children and pets there is a decided advantage in using a larger film size which can then be cropped when the slide is mounted.

"TAFFY." Color arrangement—the taffy color of the cat was accentuated by the blue pillow and the paler blue flowers in the background. The intent, alert look expresses the cat's interest in the flash and reflector. *Exposure*, two clear flash, C ¼ filter, triangle lighting, on Kodachrome Type A.

Flash is Preferable for Shots of Children and Pets

The safest lighting setup is the Triangle formula, shown on pages 30 and 31. When using flash with the two bulbs which this setup calls for, *base the exposure on the bulb on the extension cord*, not on the one on the camera. If the bulb on the camera has the same light output as the "modeling light" (on extension cord) and IF (because of a departure from the triangular setup) the camera-to-subject distance is approximately the same as the extension cord bulb-to-subject distance, reduce the effective output of the bulb on the camera by placing a diffusing screen over this bulb. If you have no such screen, drape a handkerchief or comparable piece of cloth over the bulb and reflector. The strongest light (the one on which the exposure is based) should always be to one side of the camera, otherwise the result will have that typical "flat," flash look, with little modeling.

CHAPTER SEVEN

NATURE PHOTOGRAPHY IN COLOR

NATURE subjects present a variety of problems, each peculiar to the type of subject being shot. The bird and animal photographer has a hunting and stalking task quite different from that of those who shoot wildflowers or rare plant growth in the deep woods.

Rather than cite a number of hypothetical situations I am showing, through the results of six nature photographers, the equipment used, the lighting, and the photographer's own statement as to any special problems encountered in getting these shots.

The most successful photographer of bird life I have known shoots bird nests at the time the young birds hatch and before they are strong enough to leave the nest. He first scouts for nests and once found, keeps an eye on them for developments. Then he observes the habits of the parent birds and feeding times. He then sets up his equipment

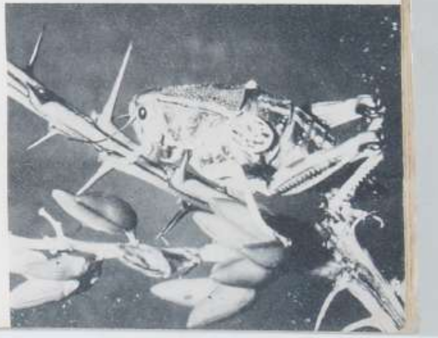
(Continued on page 60)

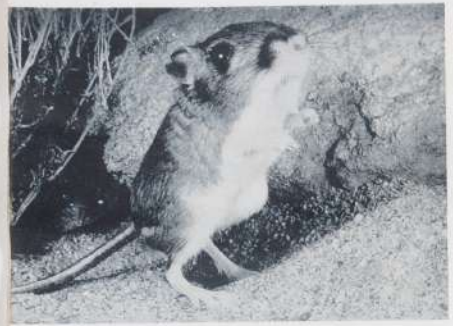
"GRASSHOPPER" H. M. WOERTZ

Film: Kodachrome Daylight
Camera: Contax 1, with Speed-o-copy and extension tube
Lens: Zeiss Tessar f/2.8
Exposure: 8 seconds @ f/20
Filter: Harrison B 4
Light: Two No. 1 Photofloods, 2½′ and 3½′ from subject
Exhibition record: Honorable Mention in PSA. Has been accepted in every salon to which submitted.

"Copying device with ground glass for focusing was used instead of auxiliary lenses because of the critical depth of focus at such short distances—about 3 inches in this case. The long exposure was necessary for several reasons, (1) the 12mm extension tube, (2) the B 4 converting filter (which requires five times normal exposure), and (3) the small aperture needed to gain depth of focus."

H. M. WOERTZ
PASADENA, CALIFORNIA





"Kangaroo Rat"

Louis B. Ziegler

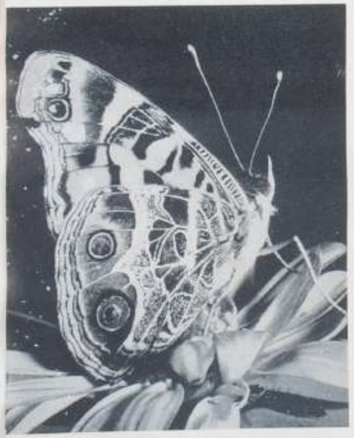
Film: Kodachrome Daylight
Camera: Leica 3F with Visoflex and Bellows Focusing Device
Lens: Hektor f/4.5—135mm
Exposure: 1/5000 sec. @ f/32
Light: Two electronic flash lamps, one main (45 degree) and one fill-in. Power, 200 watt sec. unit (Ascor)
Exhibition record: Submitted to three exhibitions, accepted by all. Awarded two medals.

"Flash is a 'must' for these lively little animals. The problem is not only movement for, being nocturnal, they will not react normally in a setup brilliantly lit with photofloods."

LOUIS B. ZIEGLER, SAN JACINTO, CALIFORNIA

(Below)
"This shot was made indoors. I keep butterflies in the dark during the day so they will not ruin their wings, then bring them out in the evening to photograph them. They are generally quite cooperative as this is not their normal time for flying. When a specimen is difficult I put a drop of sweetened water on the flower. This often keeps them quiet for five to ten minutes. I also try to choose a flower with dark or subdued coloring that does not steal the interest from the butterfly."

BERNARD G. PURVES, APSA, GLENDORA, CALIFORNIA



"Hunter's Butterfly on Aster"

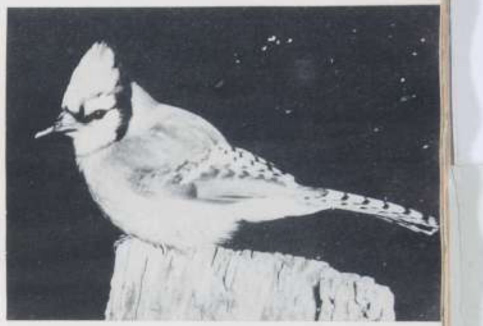
Bernard G. Purves, APSA

Film: Kodachrome Daylight
Camera: Exakta V
Lens: 50mm Zeiss Tessar on Bellows
Exposure: 1/25 sec. @ f/16 (1½ f/stop compensation for bellows draw)
Filter: None
Light: Stroboflash II 18 inches from subject, 45 degrees from camera
Exhibition Record: Seven times in nature shows, three in color.

"Blue Jay"

W. H. Savary

Film: Kodachrome Type A
Camera: Home made View
Lens: 5" Kodak Ektar
Exposure: 1/100 second @ f/14
Filter: 81B
Light: Single GE No. 22 at camera
Exhibition record: Six acceptances



"The problem in such pictures is to get the bird in the right place. In this case a bird feeder was placed at a convenient spot. The camera was placed about four feet from where the birds were encouraged to light. In the early morning birds came frequently and exposures were made readily with a remote control device. This particular shot was made in December on a cold morning and the Blue Jay had his feathers ruffled out because of the cold."

W. H. SAVARY
NORTH PLAINFIELD, N. J.

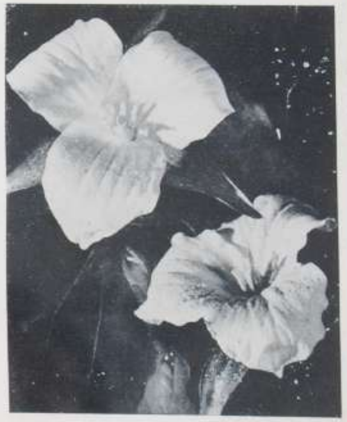
(Below)
"These Trilliums were kept in the house two or three days before shooting, and they withstood the heat of the photofloods very well. A little water was sprayed with an atomizer before shooting, for that 'morning dew' effect. A rust-colored cloth background was used to simulate the natural dried leaves and soil effect found in the woods in the spring. Lighting—one photoflood at the side for texture, one at camera position for fill-in."

DR. FRANK E. RICE
CHICAGO, ILLINOIS

"Trilliums"

Dr. Frank E. Rice

Film: Kodachrome Type A
Camera: Zeiss Ikon, with adapter back, Bantam size
Lens: Tessar
Exposure: 5 seconds @ f/25
Light: Two Photofloods
Exhibition record: Chicago Color Camera Award; three salon acceptances.



"SEA ANEMONE"

Film: Kodachrome Daylight
Camera: Leica 3F with Visoflex and Bellows Focusing Device
Lens: Hektor f/4.5—135mm
Exposure: 1/5000 sec. @ f/32
Lights: Two electronic flash lamps, one main, one fill-in, power, 200 watt sec. unit (Ascor)
Exhibition record: 6 acceptances, 5 honors, 1 medal

"This type of subject matter presents unusual exposure problems. Because of the fleshy translucent nature of the animal, there is very low light reflection (the light goes right through the flesh). Result: four to six times normal computed exposure is necessary. Flash is required as these animals are constantly moving. The anemone, of course, is under water. The form and textural quality of the exposed gullet is exquisite."

LOUIS B. ZIEGLER, SAN JACINTO, CALIFORNIA

(Continued from page 57)

(flash equipped, fired by remote control) and lets the birds become accustomed to the apparatus. When he is ready to shoot he conceals himself from view as much as possible, making the shot when a parent bird returns with food and is in the act of feeding the young. The results compensate for all the time and patience.

The photographing of growing wildflowers can best be done with a ground-glass camera with a rather long extension bellows. If cut sheet film is used, two slide size exposures can be made on each sheet, by improvising split dark slides so only one half of the sheet will be exposed at a time. Successful work can be done with long focal length lenses or front lenses, for close-ups, but such equipment is not as flexible. Regardless of which equipment is used, remember that when the lens-to-film distance is greater than the focal length of the lens, some exposure compensation must be made. On all close-up work an Eastman Kodaguide for "Effective Lens Aperture" will save many a shot for you. There are too many combinations of focal lengths, lens-to-film distances, etc., to list here. (See Chapter Ten.)

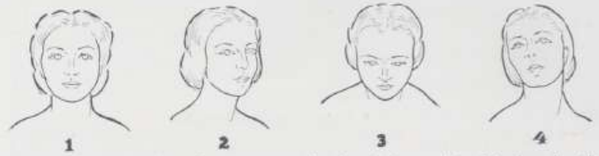
Flash is an essential in the deep woods, for plant life shots. An efficient, small reflector to illuminate shadows will save many shots even in the open under a full sun. Many nature subject shooters use electronic flash as sole light source in daylight, as did Mr. Ziegler in making the above shot.

CHAPTER EIGHT

FIGURES, INFORMAL PORTRAITS IN COLOR

PORTRAITURE is a major branch of photography, as it is of art. The subject is so expansive that it cannot be covered short of a full-sized book, and there are good ones available. The majority of color slide shooters I have encountered are more interested in informal figure and portrait studies than in serious portrait work. For them, the next few pages offer a few elementary suggestions.

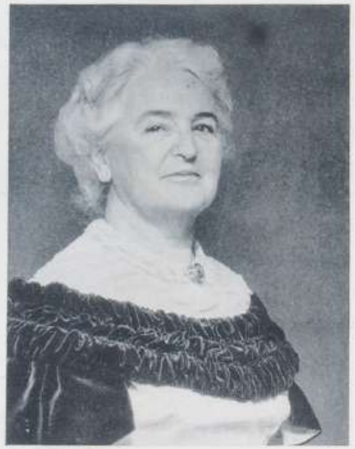
HEAD POSTURE AND WHAT IT CAN DO



1. Full-face shots make a face appear wider than it is; good to help broaden thin faces. 2. Three-quarter view makes a face appear longer and narrower, but avoid having tip of nose touch cheek outline—keep it well inside or have it break the check line decisively. 3. When a head is tilted forward or camera angle is high the nose appears longer than it is; the chin appears less prominent; the upper lip is shortened and the lower one made fuller. 4. When a head is tilted back or camera angle is low, the nose is foreshortened; chin appears larger; but it will smooth neck wrinkles.

For those of you seriously interested in portraiture may I suggest that you study color reproductions of such masters as Sir Joshua Reynolds, Franz Hals, Raphael, Velasquez, Gainsborough, Titian, Holbein and Whistler. Study their lighting, backgrounds, their handling of color and color intensities.

There are seven important steps in producing a portrait—1) is subject to be animated or relaxed?—2) decide on pose—3) select costume and accessories—4) choose background color to enhance the mood—5) decide on framing and placement of props for best composition—6) experiment with lighting—7) catch that moment when the subject expresses what you wish to capture. It is the capture of that something that *lives* which results in what can be dignified by the name *portrait*. As color should help express the mood of the subject, be sure it is appropriate to the subject. Refer to the Color Wheel and to the color schemes suggested on the last page of this chapter.

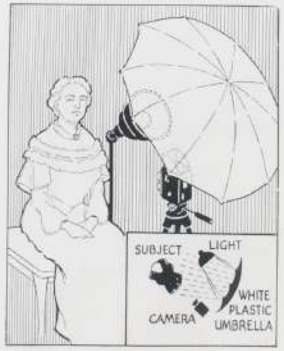


This picture is shown primarily to illustrate the effect of the use of diffused reflected light (as well as can be shown in black and white) but it can serve to point up a few general rules that can be applied to all head and shoulder shots. (1) Usually, a camera position slightly below the center of the face creates the most pleasing result. In this instance it slightly foreshortened a rather prominent nose. It also created a feeling of poise, befitting the character. (2) The figure is about three-quarter position, with head turned slightly more toward a full front view. This gives full play to both eyes rather than the too often "cramped" feel of the far eye. (3) The source of light is from slightly above, to cast some shadow on neck to give strength to the chin and to subdue the inevitable wrinkles in the neck of an older person. Such shadow would also partially disguise a double chin.

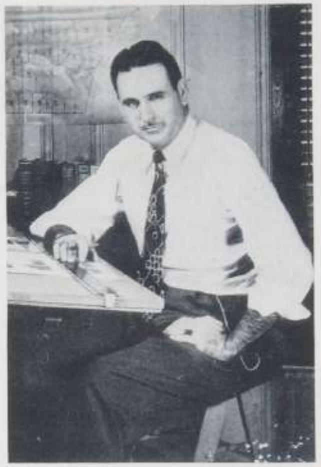
This Portrait taken by Diffused Reflected Light

The color quality of flesh tones, in any slide, is dependent primarily upon the quality of the light illuminating the flesh. The finest diffused light condition I have been able to create used means any one can employ.

The diagram below illustrates one way to create the type of reflected, diffused light used to illuminate the subject shown above. Some might call this "bounce" light, and it is, with a difference. Most bounce light is from a flat surface whereas an umbrella is a parabolic reflector. Because it is, there is one best distance at which to place the umbrella. As with all reflectors, one must experiment a bit with angles, and with the placement of the photoflood. But angles and distances can be easily determined by the visual effect on the subject, and meter readings. Try this lighting technique. You will be amazed at the unusual color quality of the flesh tones—a glowing, lively warmth.



This informal figure study suggests three ideas that can be adapted to many such shots, with pleasing effect. (1) Have the subject in an environment with which he (or she) is familiar, whether work or play. (2) Keep out of the picture area all extraneous articles or props. If anything, remove some that normally belong if they tend toward clutter. (3) Have figure in plain, solid color clothing, the fewer the patterns the better. The clothing color or tone value should contrast sufficiently with the background to pull the figure forward from it. White did it here—white against a natural wood wall. And most important, subjects at activities with which they are familiar are more likely to fall into easy, natural positions — better than you can pose.



People doing something make interesting Figure Studies

Keep in mind the distinction between "portraits" and "figure studies." In the first, everything must, of necessity, be subordinated to the best possible rendition of the subject's character—and true color of flesh, hair and eyes is a part of the story. In informal figure shots everything within the picture area is an integral part of the picture story. That is one reason why such studies are usually more interesting when the subject is doing something — some activity with which they are associated. The study at the right would be very static and "posed" if the colored woman were merely sitting, staring at the camera. The result would be neither a portrait nor an interesting figure study. When you plan the shot decide what you wish to express.

Color Association in Portrait and Figure Studies

The color composition of a portrait or figure study should be conceived and created in the order of importance of the elements, and the areas they occupy, and generally in the following sequence:

1. COSTUME. Its color should harmonize with the sitter's complexion type, and should be *appropriate* to the mood to be expressed. It is obvious that more intense, more "vivacious" colors can be used with a vivacious person, and that grayer, less intense colors will better express a calmer personality. It is equally true that more intense colors can be used with a person with strong flesh tones and dark hair than should be used with fair flesh tones and very blond hair. Grayed cool colors (either light or dark value) will enhance the warmth of delicate flesh tones. Warm colors can be used with any complexion type if the costume color is separated from the flesh with white or a neutral—a collar, scarf or similar. An all white costume, against an appropriate background, will place color emphasis on the flesh tones.

2. BACKGROUND. A background should be just that in portrait studies, and completely subordinated to the flesh and costume. The best background is one the viewer cannot remember after he has ceased to look at the slide. In figure studies backgrounds often tell part of the picture story, but they should be of secondary interest. In either portrait or figure studies the background should contrast with the figure in color or tone value, or both, and in all cases the intensity of the background colors should be weaker than the intensity of the colors in the costume.

Fair-complexioned subjects in light value costumes are best against backgrounds of darker tone value than the darkest tones in the figure. Dark-complexioned, black-haired subjects are usually most effective against backgrounds that are rather light in tone value or that are darker than the flesh but lighter than the hair.

Background colors, when too intense, tend to *add* the background's complementary color to the flesh tones—strong warm colors will make delicate, pale flesh appear "cooler" and paler; strong cool colors will make brunette flesh tones appear "yellowish" or even "greenish."

3. INCIDENTALS. Simplicity in number of elements and in color is the keynote for good portraits. In figure studies objects that support the theme of the picture may often be used both to add to the picture story and as effective spots of color accents. Keep out all extraneous objects.

The foregoing may seem to limit the number and kind of colors that can be used. While it is true that more subdued colors create the most artistic effect, portrait and figure shots need not be confined to the weaker colors, as the following listing suggests. How effective these combinations work out depends as much upon the intensities and tone values of the colors as upon the hue or color used. The list below is only a beginning, but it may help start your thinking.

BRILLIANT COLOR COMBINATIONS

Costume	*Background*	*Small Accents*
Dark Green	Dull Gold	Spectral Red
Gold	Gray Blue	Vermilion
Dark Blue	Light Turquoise	Scarlet Red

GRAYED COLOR COMBINATIONS

Costume	*Background*	*Small Accents*
Gray Blue	Silver	Pink
Pearl Gray	Dark Cardinal	
Silver	Sage Green	Pale Rose
Beige	Heliotrope	
Cream	Brown	Gold

LESS BRILLIANT COLOR COMBINATIONS

Costume	*Background*	*Small Accents*
Delft Blue	Amethyst Purple	
Dark Brown	Apricot	Blue
Chestnut Brown	Cream	Bottle Green
Beige	Peacock Blue	
Sage Green	Bottle Green	Gold
Buff	Soft Blue	Rose
Honey Color	Emerald Green	

(Diagrams for portrait and figure lighting are given in the chapter on Artificial Lighting.)

CHAPTER NINE

SLIDES LIKE THESE MAKE THE SHOWS

THE assumption is that you want to continually improve your color slide results, regardless of what you shoot or why you shoot it. There is no better way to pick up helpful suggestions than to see and study other photographers' slides, and above all, to see your own in direct comparison with the work of a considerable number of people.

If you do not belong to a camera club, join one for at least a year—a *color* camera club, preferably. Many clubs have a color division which invites speakers on color problems; goes on field trips; does some studio shooting; and most important, periodically has projected shows of the work of club members. Do not be timid about submitting slides for such showings. You will find many poorer than your own, and some better. Study carefully what seems to be the strong points of the best slides. Talk to the producers of the ones that impress you. Most people are more than cooperative and will tell you all their "secrets," which in most cases turn out to be no more than careful work and a little more thought.

After you have flexed your photographic muscles locally, submit your best slides to some of the Color Slide Exhibitions held in this country and abroad—dozens of them each season. In these shows your work will go up against a fair cross-section of the better-than-average color slide shooter.

Usually, 20% to 25% of the slides submitted get into such exhibitions, so acceptance means a very considerable commendation of your ability. Awards are frequently given the top five slides in the show, and Honorable Mentions are voted another ten or more. Your work will be analyzed by competent judges, most of whom are color slide shooters with a good exhibition record of their own.

What the Judges Hope to Find

Most judging is based on three essentials which can be briefly designated as INTEREST (in subject matter), COMPOSITION, and TECHNICAL QUALITY. Any slide that is high in all three is "in," without further consideration. Other slides may be excellent in one or two of the essentials but weak otherwise. If such slides are striking they are included immediately or put aside for further consideration, and the best of them will eventually be accepted.

Ones that are devoid of any interest, that are poorly composed, and that are further cursed by poor technical quality are rejected as soon as they are shown.

A tip on selecting slides for submission to these International Exhibitions—*interesting subject matter* will rate higher with most judges than either composition or technical quality, although this one element alone will not assure acceptance. But I can practically guarantee that technical excellence *without* interest or good composition will be rejected.

Subject Matter for Exhibitions

All general exhibitions are open to all types of subject matter. (There are, however, some exhibitions devoted exclusively to Nature subjects.) I cannot tell you what subjects will be accepted, nor what ones will be given awards. But I can give you a fairly accurate warning as to subject matter that will more likely than not get thumbs-down votes. The highest "mortality" rate is among

—snapshots of family or friends (a character or portrait study, if well done, will get most careful consideration).

—landscape scenes that are merely cross-country shots (to get attention a landscape should be an unusual composition or a dramatic, relatively close-up or dominating formation, or most any landscape under unusual light conditions. Even splashes of Fall color, without interesting composition, do not get far).

flower or still-life studies that are not well composed (close-ups of flower forms, or well arranged still-life subjects rate high in most shows).

There are other miscellaneous subjects that do not fare so well, but the above three categories contain the highest percentage of "fatalities" in most judging. The one common weakness of such unacceptable subjects is that they do not command and hold interest.

Copy Techniques but Not Ideas

Thousands of you are not interested in participating in camera club activities but I am sure every color shooter desires to improve his color slide results. It doesn't matter if you shoot color "just for fun" (and everyone should enjoy his hobby), you have a considerable investment in camera and projection equipment and a continuing investment in film and processing. Poor shots cost as much as good ones. Observe the techniques of successful amateurs and apply them to your problems. Copy techniques but be original in ideas.

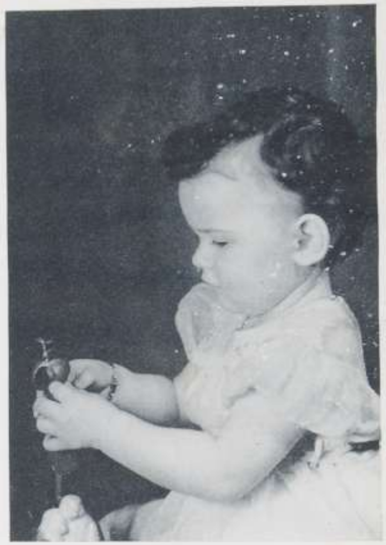
"CONTEMPLATION"

TIMOTHY M. LAWLER, JR.

Film: Kodachrome Type A
Camera: Contax III
Lens: 5 cm. Zeiss Sonnar f/1.5
Exposure: 1/125 sec. @ f/2.8
Filter: None
Light: Photofloods, two No. 2's for main light, one No. 2 on hair, four No. 1's on background
Exhibition record: Several acceptances, one Award

"This subject presented the usual problems with one so young. After several unsuccessful attempts to get a natural pose of the little girl, I handed her a small potted plant to hold her attention. It proved successful and I was able to get several good exposures before the plant was a total loss."

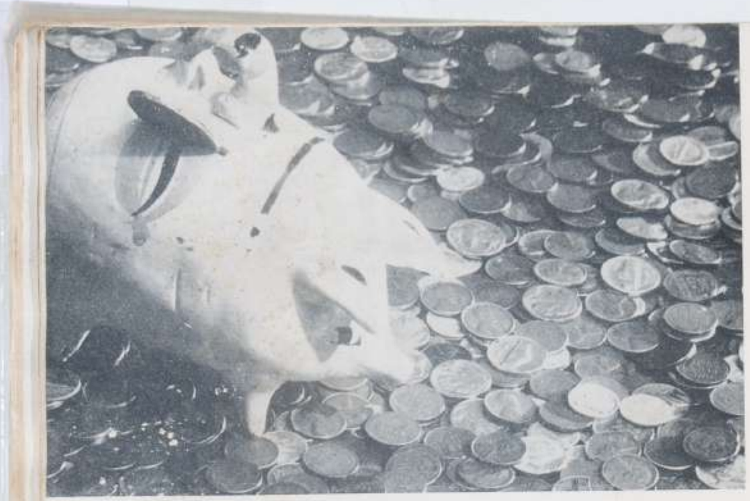
TIMOTHY M. LAWLER, JR.
KENOSHA, WISCONSIN



Study the Pictures on the Following Pages

Unfortunately, no book can reproduce, in full color, the 250 to 350 color slides accepted by the average International Color Slide Exhibition. Through the whole-hearted cooperation of some of the more consistent producers of acceptable and award-winning slides, this book does present a wide variety of interesting shots on the next several pages. You would like to see them all in color. So would I.

But as has been reiterated almost to the point of boredom, interesting subject matter—the unusual—the commonplace presented in an uncommon manner—planning and ingenuity—originality—these are the factors that make a "picture." These black and white reproductions tell the story the picture tells, minus only the beauty and *added* interest and realism the color "coating" provides. Study these pictures, analyze them, criticize them, and compare them with similar projects you have attempted. To better interpret what happened and why, read the technical data and the comments of the makers of each slide. Try to see the situation through his eyes and attempt to follow his mental processes as he solved the problem.



"THE BIG PIG" JACK CANNON

Film: Kodachrome Type A
Camera: Leica
Lens: 90mm Elmar f/6.3
Exhibition record: One 3rd award, 3 Hon. Mention, 9 acceptances

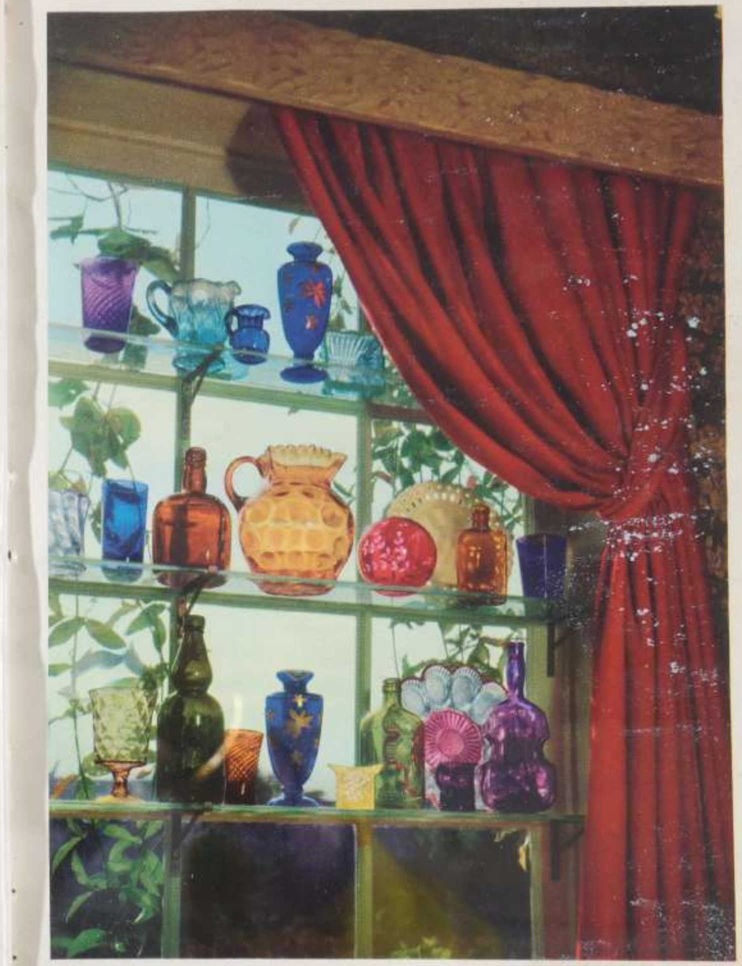
Exposure: 10 seconds @ f/16
Light: One No. 2 Photoflood, one 100 watt Spot. Cardboard reflector.

"The lighting was relatively simple. The main light was the No. 2 photoflood, high and back. The front plane of the piggy bank was illuminated by a cardboard reflector. Then a 100 watt spot light was placed low and back, covered with a light yellow gelatine to emphasize the color of the pennies and to create colored highlights."

JACK CANNON
SAN FRANCISCO, CALIFORNIA

Combining Transmitted Daylight and Indoor Flash

The shot on facing page was made when the sun was about 25 degrees above the horizon and to right, blocked off from lens by the curtain. The drape would have recorded dark and colorless if it had not been illuminated by one No. 22B (blue) flash, to the right and higher than camera. The flash had little influence on the glass as the transmitted sunlight was stronger than the flash. Remember that colored translucent objects are much more colorful by transmitted light than by reflected light.



"Miss Dali Freud"

Emmett E. Smith

Film: Kodachrome Daylight

Camera: Leica Model A

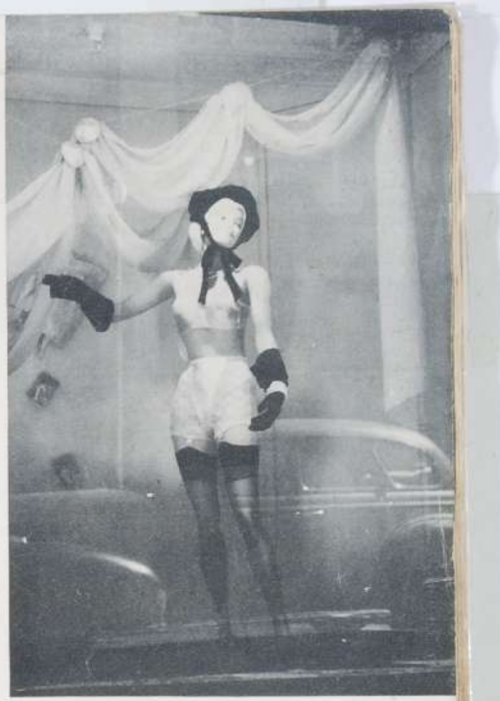
Lens: 50mm Elmar f/3.5

Exposure: 1/30 second @ f/4.5

Filter: None

Light: Daylight plus Window Lights

Exhibition record: Medal Award, Chicago International

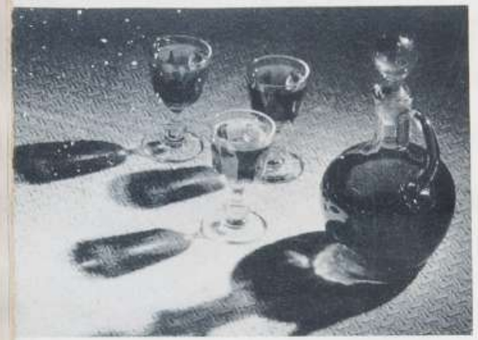


"Miss Dali Freud is an example of capitalizing on afterthought or discovery ex post facto. It started out as a grab shot merely to record an extremely eye-catching window display. I was vaguely aware of the reflection in the window but considered it unimportant at the time. Since then, through rationalization, I became aware that it contributed much to the developed idea and I never cease to be dismayed when people say, 'Too bad you couldn't avoid the reflection of the automobile.' To me the transparent quality of the car image lends a dreamlike effect which suggests a surrealist treatment."

Emmett E. Smith
Mill Valley, California

Photoflash as Sole Light Source

It is very much a matter of personal preference whether photoflood or photoflash is the better light source for such color subjects as the one on the facing page. Flash provides a higher level of illumination, permitting faster shutter speeds and smaller f/stops. With children or pets this often means the difference between getting a good shot or a "movie" on still film. For portrait or figure shots by flash determine light placement with floods, to check modeling and contrast, then replace floods with flash lamps for the shot. (The shot at left was made on daylight type film with blue flash, triangle lighting setup.)



"Not Always a Crowd"

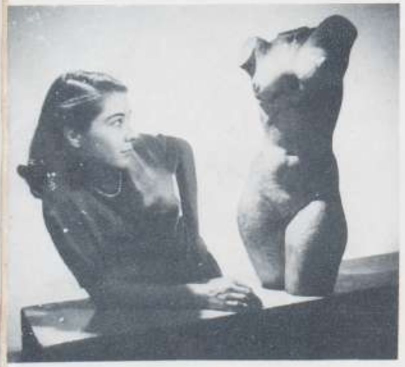
P. W. Young

Film: Kodachrome Type A
Camera: Contax II
Lens: 135 mm.
Exposure: Time, by meter
Filter: None
Light: Strongly side-lighted with spotlight, fill-in at camera subdued.
Exhibition record: Nine acceptances, one Award

"The name of this shot came from the need for a third glass in the picture, to better balance the composition. Two glasses and the decanter didn't work out right in any arrangement. The original idea was to make the colored shadows the dominant part of the picture, which I think was pretty well carried out. A Contax Universal Viewer was used for arranging the composition." P. W. YOUNG, MINNEAPOLIS, MINNESOTA

(Below)
"This shot was made one evening at the Yellow Springs Camera Club. A torso cast was borrowed from the college classrooms, with no particular idea in mind. It was placed on the posing box, and when the young lady was placed beside it, the idea of having her look enviously at the torso occurred. The envious look, not overdone, the soft coloring throughout, and the simplicity of the picture made a happy combination."

ART F. SHEA
DAYTON, OHIO



"Torso"

Art F. Shea

Film: Kodachrome Type A
Camera: Bantam Special
Lens: 45 mm. Ektar
Exposure: 1/25 @ f/2.8
Filter: None
Light: Two No. 2 Photofloods on subject, one on background
Exhibition record: Several acceptances, two Awards

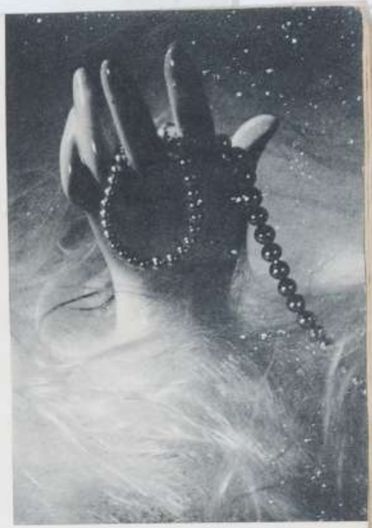
"Fantasia"

George Blaha

Film: Kodachrome Type A
Camera: Recomar with 35 mm. back
Lens: 105 mm Zeiss Tessar
Exposure: 1/5 second @ f/11
Filter: None
Lights: Three 500 watt spotlights, with red, blue and green gelatines.
Exhibition record: Submitted and accepted seven times, three Awards, two Honorable Mentions.

"An experiment with colored lights. A ceramic hand, a string of pearls, and glass wool were combined to create this still life which is almost an abstraction. The glass wool was used to create the impression of suspension and to provide contrast in texture."

GEORGE BLAHA, CHICAGO, ILLINOIS



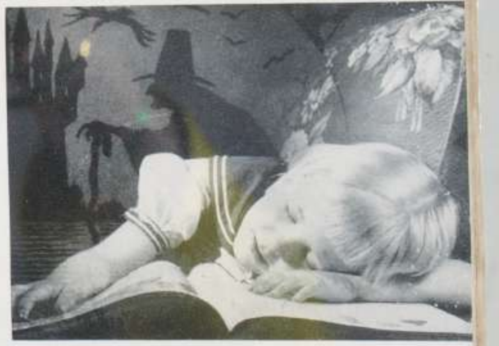
(Below)
"This is a double exposure. First was of child asleep over the book. Lighting, No. 2 Photoflood at camera, 60 watt mazda in table lamp to highlight and give warmth. All background behind subject blacked out with cloth. Position of blacked out background marked on ground glass. Second exposure took place in this background area, and was a close-up shot of the end sheet in the book, cut to half time to give silhouette effect."

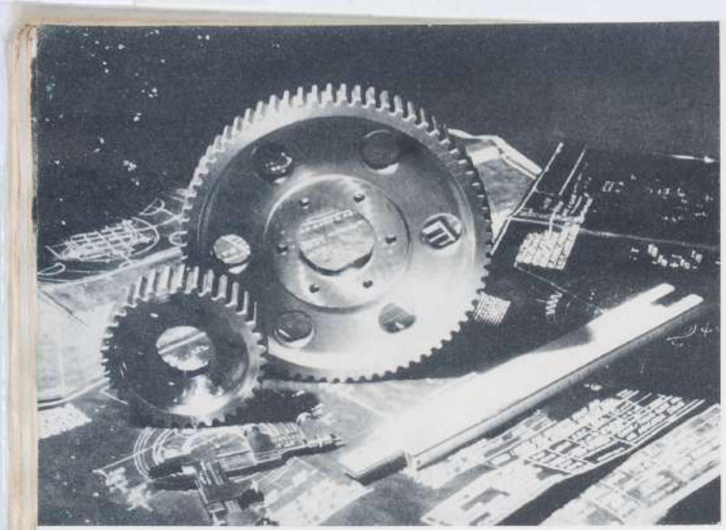
V. J. ROUFS
ST. PAUL, MINNESOTA

"Dreamland"

V. J. Roufs

Film: Kodachrome Type A
Camera: Recomar, Bantam back
Lens: Schneider Xenar
Exposure: Time, by meter
Filter: None
Light: See above
Exhibition record: Accepted wherever submitted, two Awards.





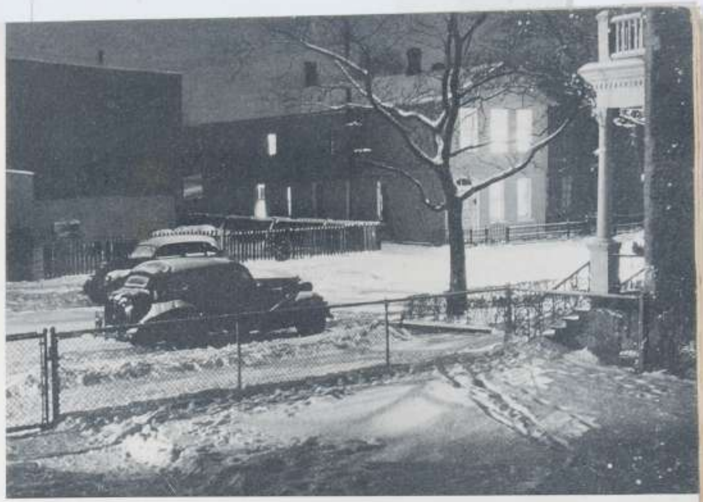
"CULMINATION OF DESIGN" R. E. MCADAMS

Film: Kodachrome Type A *Exposure:* 1 second @ f/18
Camera: Leica IIIb *Filter:* None
Lens: 50mm Elmar f/3.5 *Light:* One No. 2 Photoflood in desk stand
Exhibition record: One Honorable Mention, seven acceptances

"The desire to make this picture was probably due to my close association with the fabrication of these gears and the final checking to very precise tolerances. At the end of the day's work on the gears the natural arrangement and their beautiful surface texture prompted me to place a No. 2 Photoflood in a desk stand for illumination and make a record of what seemed to be a nice association of related elements. Some slight rearrangement of the elements was made but no elaborate preparations were needed. For the purpose of filling the picture space properly with the subject matter an Optical Short Distance Focusing Device was used."

R. E. MCADAMS
SPRINGFIELD, OHIO

This is an excellent example of making a picture of elements close at hand. The "cool" color scheme has sufficient tone and intensity contrasts to make it most effective purely from the standpoint of color harmony. The blue of the blueprints seem to give added emphasis to the steely blue of the gears. Technically, the only criticism I would apply to this shot is the result of a hazard that could hardly be avoided—the hard, highly reflective surface of the slide rule is "burned out" in color and detail, but this is forgivable. This shot most effectively uses subject matter to tell an integrated story.



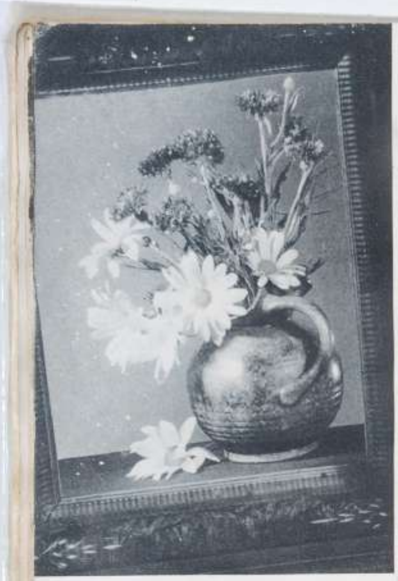
"IT'S WARMER INSIDE" RUTH V. WELTY

Film: Kodachrome Type A *Exposure:* 7 minutes @ f/8
Camera: Argus C-3 *Filter:* None
Lens: 50 mm. Cintar f/3.5 *Light:* Street lights only
Exhibition record: 15 acceptances, 2 Awards, 3 Honorable Mentions.

"Being particularly fond of night shots, I had ventured out to take several snow scenes one cold winter evening. It was 3 below zero, and after taking two time exposures my hands and feet became pretty numb, so I packed my equipment and decided to call it 'quits'. Entering our front door I happened to notice the house across the street, which looked so inviting with its warm, yellow lights. I thought this cozy atmosphere might create an interesting effect, so set up the tripod once more, and this shot is the result."

RUTH V. WELTY
CHICAGO, ILLINOIS

This shot, and the lady's experience, should be evidence again that pictures are where you find them—the ability to know one when you see it. It should also prove that getting good pictures requires a little work, brain as well as leg. Successful photography is hardly a lazy man's hobby, although there are thousands of pictures that prove that the shot is no picture principally because the photographer was unwilling to make the effort to make it better.



"Memories"

V. J. Roufs

Film: Kodachrome Type A
Camera: Recomar, Bantam back
Lens: Schneider Xenar
Exposure: Time, by meter
Filter: None
Lights: Photoflood with blue filter on the beaded screen background. Two No. 2's on subject, one at camera
Exhibition record: Several acceptances, one Award

"Intent, to show flowers in other than ordinary way. Frame tilted to eliminate static effect, and lighted so it would not be too obtrusive. A second problem was to get a pleasing background that would make the flowers and vase the center of interest."

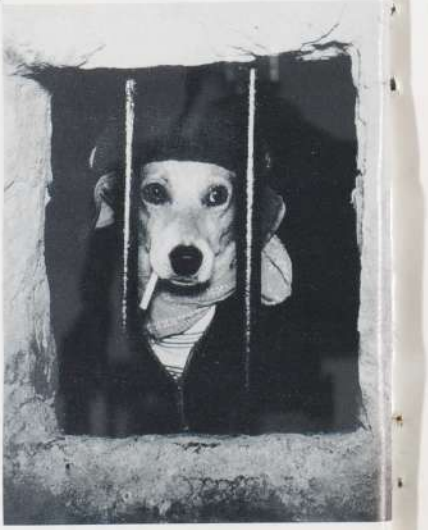
V. J. ROUFS, ST. PAUL, MINNESOTA

"Jailbird"

John Bright

Film: Kodachrome Type A
Camera: Argus C-3
Lens: Cintar f/3.5
Exposure: Open flash, f/18
Filter: 81B
Light: One No. 11 flash on extension
Exhibition record: Several acceptances, two Honorable Mentions

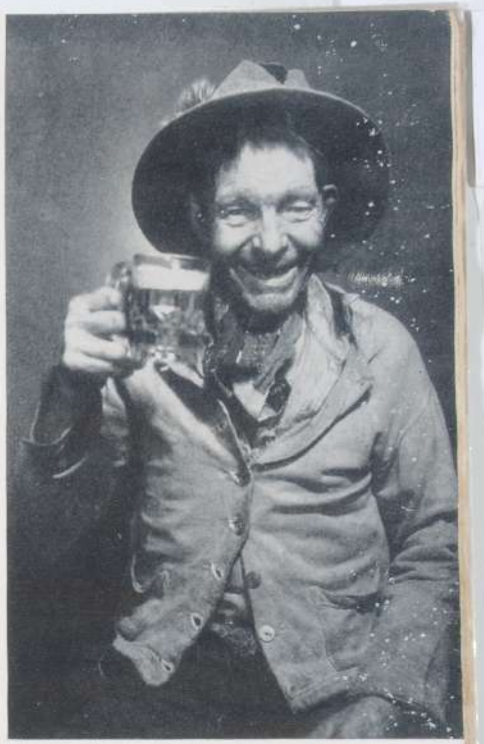
"The jail was made of four natural stones, with wood rods on which I let the paint run to produce rough steel effect. The cigarette was a rolled sheet of paper stuck between two of the dog's teeth. He would not hold a real cigarette. I have used my dog 'Mickey' so much he will hold about any pose I desire."



"Here's To You!"

Thomas Limborg

Film: Ektachrome Type B
Camera: Medalist II
Lens: Ektar f/3.5
Exposure: 1/10 sec. @ f/4
Filter: None
Light: One 1500 w 3200 K for cross-lighting, and one 500 w 3200 K by the camera
Exhibition record: Several acceptances, one 1st Award, 3rd prize Popular Photography Monthly contest.



"After discovering this Finlander and doing him in black and white, I went back the following year to take him in color. After a lot of persuasion he finally consented to pose. Getting all the lights and background arranged in an old barn, the setting seemed to be perfect. But getting the model in the proper mood was my main problem as he was mostly interested in the fee. Being a hermit and hard of hearing, he got impatient and drank the first few glasses of beer. After that he was in very good humor and this shot is the result."

THOMAS LIMBORG
MINNEAPOLIS, MINNESOTA

This is an excellent character study, with all the feeling of authenticity in character as well as action. It is proof that the best character studies are "natural" ones, not acted out nor camouflaged with a lot of make-up, props or phony accessories. There are not enough of such subjects in the average color slide salon, and it might well pay color camera clubs to provide good character models for a night's shooting each year.

General Rules for Color Slide Competitions

If you would like to check your efforts against those of the better-than-average color slide shooter, send some of your best things to one of the big exhibitions. The rules are simple, and those given here are, in general, those stipulated by most of the exhibitions. If you are not a member of the Photographic Society of America and do not get notices of such exhibitions, you will usually find a schedule in your favorite photographic magazine.

Here are the general rules:

1. Slides cannot be submitted a second time to the same exhibition in a subsequent year.
2. You can submit one to four slides, usually restricted to the 2"x2" mounting glass size, although some exhibitions accept 120 size (2¼"x2¼"). Entry fee is usually $1.00.
3. Slides must be clearly marked with the title, maker's name and address. Each must be spotted in the LOWER LEFT HAND corner. Slides may be in glass or cardboard mounts but glass is recommended. Slides bound in glass over Ready-Mounts are INELIGIBLE.
4. Entry form, entry fee and slides should be shipped in same package, and all packed securely with corrugated board. It is best to mail first class, and be sure your name and return address is clearly marked on the package.
5. Rejected slides will be returned promptly; accepted ones shortly after the conclusion of the exhibition.
6. Slides are submitted at the owner's risk.

That's all there is to it. I strongly urge that you expose your best efforts to such comparison tests, and keep on with your exhibiting for a period, at least. Do not stop because your first offerings are rejected. The experience will be a stimulus to more studied efforts, and your results will improve as you get into the competitive spirit of these very worth-while exhibitions.

CHAPTER TEN

PROBLEMS IN CLOSE-UP SHOTS

PRACTICALLY every color slide shooter now and then desires to make close-up shots—to work closer than most camera lenses will permit. The average lens on either a 35 mm or a 120 size reflex camera has a minimum working limit of 30" to 36", or farther, from the subject. This limitation is no fault of the lens. There simply is no way to rack the lens farther from the film, as one can do with a bellows camera.

This chapter suggests some of the problems of close object-to-camera shooting; some of the means whereby such shots can be made; and a few tables that can be a guide to more accurate work, and close-up shooting involves more accurate calculations than are necessary in average slide shooting. Only a few tables can be given because there are dozens of lens and extension tube combinations and each has its own formula. I hope this short discussion will also help in the selection of lenses and other accessories needed for the particular kind of close-up work you may wish to do.

Some of the Problems

1. The closer the working distance the more accurate the framing must be. The average view finder cannot be adjusted to correct parallax. The closer the camera is to the object the more inaccurate is the view finder coverage. Reflex cameras solve the problem through use of a ground glass. And there are ground glass focusing (and framing) devices for detachable single lens cameras like the one illustrated on the next page. A plumb bob can be used with view finder cameras, or calculations can be worked out with a celluloid triangle, to locate center of picture area, but this will be of little help in accurately framing the picture unless you draw or cut a mask of the exact area covered by the view finder at the distance you will work.

2. The second hazard is correct exposure. If you have ever worked with a view camera you know that when the bellows is extended so that the lens-to-film distance is greater than the focal length of the lens, some exposure compensation must be made; the farther the extension the greater the compensation must be. When extension tubes are used the increased distance from lens-to-film has the same effect on exposure as does bellows extension on a view camera. (The Eastman "Effective Lens Aperture Guide" calculates exposure compensations quickly.)

These lenses will fit all the popular twin lens reflex cameras that take regular 120 size film (2¼"x2¼")

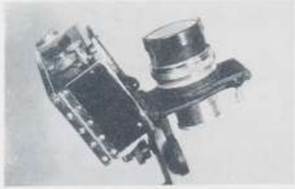
Supplementary Lenses for Twin Lens Reflex Cameras

Such lenses come in pairs, one for the viewing lens, the other for the taking lens. The lens pair shown comes in a mount rather than separately, to avoid possible confusion in use. Such lenses have limited working range, so it is important to know which you will need for a specific shot, unless you own a full set. The range of this particular make of supplementary lenses is:

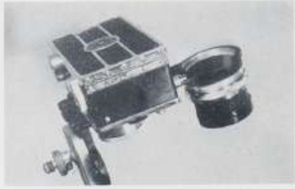
Model	Camera setting	Lens-to subject Distance	Depth of Field at f/11 (inches)	Reduction Ratio
1	Inf.	39"	32¼ to 46½	15:1
	4 ft.	19"	18¾ to 22¼	7¼:1
2	Inf.	20"	18 to 21½	7½:1
	4 ft.	13"	12¾ to 14½	4½:1
3	Inf.	14"	12½ to 14	4¾:1
	4 ft.	10"	9¼ to 10½	3½:1

No exposure compensation necessary with these lenses.

Ground Glass Focusing and Framing Device for Single (detachable) Lens Cameras



The ground glass focusing and framing device in position over the camera lens. Camera is swung out of position while focusing is done.



Focusing device swung out of position and the camera in position over the lens, ready to make the exposure.

ARGUS C3 WITH SPEED-O-COPY

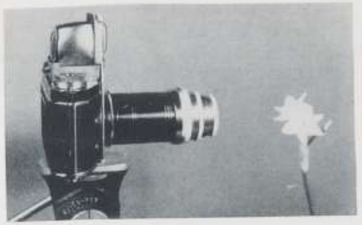
The table below is for the above device when used with an Argus. Similar figures would apply to any 35mm camera with a 50mm lens.

		Lens Extended	
	Approx. Area Covered	Lens to Object Distance	Exp. Factor
Lens and Minus 3 aux. lens	9 5/32 x 13¾"	33½"	1.14x
Lens, Minus 3 aux. lens & 3/16" tube	6 3/16 x 9 9/32"	16¼"	1.25x
Lens, Minus 2 aux. lens & 3/16" tube	4½ x 6¾"	11¾"	1.4 x
Lens, Minus 3 aux. lens & ⅜" tube	4 x 6 "	10⅞"	1.5 x
Lens only	3 27/32 x 5 49/64"	9½"	1.53x
Lens, Minus 2 aux. lens & ⅜" tube	3¼ x 4⅞"	9 "	1.67x
Lens and 3/16" tube	2 13/16 x 4 7/32"	7⅜"	1.77x
Lens and ⅜" tube	2¼ x 3⅜"	6⅛"	2. x
Lens, 3/16" and ⅜" tube	1¾ x 2⅝"	5⅛"	2.5 x

Lens and 1½" tube give almost full image, but not full coverage on the film. This tube is intended for microscopic use only.

Using Extension Tubes on a Single Lens Reflex Camera

Camera-to-Subject Distance with Tubes



The above illustration shows an Exakta with a three-piece extension tube combination (section lengths approx. ¼", ⅝", and 1 7/16") which, with adapter rings extends the regular lens more than 2" beyond its normal position on the camera. This is, in effect, the same as the bellows extension on a view camera. The lens on the combined tubes is over 4" from the film or more than twice the focal length of this lens, a 2".

The illustrations at the right are actual image size on the film for each of the tube and lens combinations given under each frame. The exposure compensation necessary in each case can best be expressed by the following formula:

f/stop "Normal" Exposure TIMES $\frac{\text{Focal length of lens}}{\text{Lens-to-film distance}}$ EQUALS f/stop to be used

This is the way two examples work out:

Indicated f/stop — f/stop to be used

$$f/8 \times \frac{2'' \text{ Lens}}{3'' \text{ L-to-F}} = f/5.3$$ —approximately twice "normal" exposure

$$f/8 \times \frac{2'' \text{ Lens}}{4'' \text{ L-to-F}} = f/4$$ —four times "normal" exposure

It is often helpful to be able to calculate in advance what image size will be with various lens extensions. These relationships are roughly:

When Lens-to-Film Distance is	*Image size, in relation to object size is (approx).*
¼ more than focal length of lens	¼ object size
½ more than focal length of lens	½ object size
Twice the focal length of lens	Same, or actual size
3 times focal length of lens	2 times actual size
4 times focal length of lens	3 times actual size

Relative Image Sizes

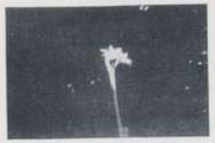


Image size, lens only Object-to-film about 25"

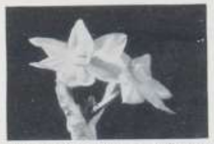


Image size, lens on ¼" tube Object-to-film about 9"

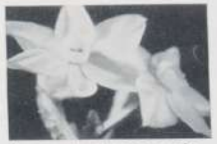


Image size, lens on combination of ¼" and ⅝" tube

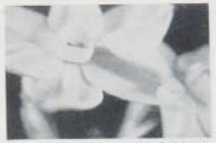


Image size, lens on 1 7/16" tube Object-to-film about 7¾"

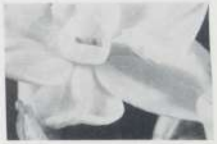


Image size, lens on combination of three tubes (2 1/16")

Depth of field, or the total depth that can be held in focus is a third hazard on extremely close work. To illustrate this point the shots of the flower (except the bottom one) were all made at the same shutter speed and the diaphragm opened the necessary amount for each additional section of tube added. The first shot with lens only, at f/11 held all of the object in focus. The second shot, at f/8 held most of the flower in reasonably sharp focus even though object to film distance was only 9″. The third and fourth shots, with focus on center of flower, are badly out of focus both in front and back. The fifth shot, focus on center of flower again, and with lens stopped to f/22 (time exposure) held only the center portion of the flower in passably good focus. (Image size is larger than actual as lens-to-film distance was greater than lens-to-object distance.)

What to do? The truth is that any 2″ lens, so extended, cannot hold much depth of field in sharp focus even at f/22. In such close work the object itself must be shallow from front to back, preferably not more than ⅓ to ½ the focal length of the lens. This places a severe limitation on subject matter, obviously. Small insects, butterflies if mounted rather flat and posed in flat plane parallel to film plane, and dozens of other interesting subjects can be shot extremely close up, but the flower specimen I deliberately used was too expansive front to back, for acceptable results.

Close-work accessories for other cameras. It must not be assumed that close-up shots are limited to the cameras and accessories illustrated in these pages. Those shown are more or less typical of the great range of lenses, tubes, focusing devices and whatnot, for all types of small cameras.

Perhaps the most commonly used device is a supplementary front lens for single lens cameras. The most practical, all purpose front lens is often called a portrait lens. I have one for a 35 mm camera that serves for work from 17″ to 25″, object-to-film distance. This is the scale:

Camera setting	*Object-to-film distance*
at Infinity	25 inches
at 20 feet	24 inches
at 13 feet	23 inches
at 10 feet	22 inches
at 8 feet	21 inches
at 7 feet	20 inches
at 5 feet	19 inches
at 4 feet	18 inches
at 3½ feet	17 inches

Single front lenses of this type are especially useful in making close-up shots of flowers and objects of similar size but the image on the film is still small in relation to the actual size of the object.

Supplementary Lens Series. A very practical set of front lenses that will cover the needs of most workers is something like the Eastman Portra. There are three lenses in the set with which six combinations can be made, allowing working distances (object-to-film) of 39″ down to about 5½″. To get an idea of what these lenses will do, consult the following table:

Supplementary Lenses with a 50 mm Lens on 35 mm Camera

Portra lens or combination	Camera Focus	Subject Distance	Depth of Field at f/8 From	To	Approximate Field Size
1 +	Inf.	39″	35″	48″	19 ″ x 28 ″
	4 ft.	21½″	20″	25″	9½″ x 14 ″
2 +	Inf.	19½″	18½″	22″	9½″ x 14 ″
	4 ft.	14″	13″	15″	6¼″ x 9¼″
3 +	Inf.	13″	12½″	14″	6¼″ x 9¼″
	4 ft.	10⅜″	10″	11″	5 ″ x 7½″
3 + plus 1 +	Inf.	10″	9⅝″	10⅜″	4¾″ x 7 ″
	4 ft.	8¼″	8″	8½″	4 ″ x 6 ″
3 + plus 2 +	Inf.	8″	7¾″	8¼″	3⅞″ x 5¾″
	4 ft.	7″	6 13/16″	7 3/16″	3⅜″ x 5⅛″
3 + plus 3 +	Inf.	6½″	6 5/16″	6 11/16″	3⅛″ x 4¾″
	4 ft.	5⅝″	5½″	5¾″	2⅞″ x 4¼″

This table should be given some study before you plan to do much extremely close work. You understand, of course, that the tables with the lenses give all of the above distances and dimensions for camera settings between infinity and 4 feet. The two extremes are shown here only to indicate the limits within which the lenses or combinations work. If you recall the earlier mention of lack of depth of field close up you can verify just how limited is the capacity of a lens even at f/8 when subject distance is 8 inches or less. In the case of the last combination, with camera set at 4 feet, the depth of field is ¼ inch only.

Increase Exposure Time rather than f/stop. The formula on page 81 determines f/stop compensations as lens-to-film distance is increased. As depth of field is always a problem in close-up work, translate larger f/stop openings into increased exposure time—and use smallest f/stop possible. For instance, if the formula indicates f/8 instead of "normal" f/11, use f/11 but double exposure time, four times at f/16, and so on.

As brief as is this chapter I hope it suggests some of the possiblities, as well as limitations, of close-up shots. But don't let the hazards discourage you. The results are sufficient compensation for all the effort and risk. Subjects like insects deliver a terrific impact when projected on a screen 50 or more times their actual size.

FILTERS FOR CONVERTING COLOR FILMS TO VARIOUS ARTIFICIAL LIGHT SOURCES

Numeral only or numeral followed by letter indicates Eastman filter. Letter followed by numeral indicates Harrison & Harrison filter. Decamired equivalents on page 91.

TYPE OF ROLL FILM	Light Source to which Balanced	Exposure Index (ASA)	CONVERSION FILTER NEEDED WITH THESE LIGHT SOURCES									
			Daylight	E.I. with Filter	Photoflood 3400 K	E.I. with Filter	3200 K Lamp	E.I. with Filter	Clear Flash 3800 K	See Note B	Electronic Flash 6500K	Exposure Increase (see Note C)
Kodachrome Daylight	Daylight	10	NONE		80B or B4	5 2.5	80B+82A or B5	3 1.5	80C or B2	Increase 1 f/stop	81A or C ⅛	1/3 f/stop
Kodachrome Type A	Photoflood	16	85 or C4	10	NONE		82A or B ⅛	12	81C or C ¼	Increase 1/3 f/stop	85B or C5	2/3 f/stop
Kodachrome (and Dynachrome) Type F	Clear Flash		85C or C2	10	82A or B ⅛	12 6	82C or B ½	10	NONE		C3	1/2 f/stop
Ektachrome Daylight	Daylight	32	NONE		80B or B4	12	80B+82A or B5	8 4	80C or B2	Increase 1 f/stop	81A or C ⅛	1/3 f/stop
Ektachrome Type F	Clear Flash		85C or C2	16	82A or B ⅛	16	82C or B ½	12	NONE		C3	1/2 f/stop
Ektachrome EH135 Daylight	Daylight	160	NONE		80B or B4	50 25	80B+82A or B5	40 20	80C or B2	Increase 1 f/stop	81A or C ⅛	1/3 f/stop
Ektachrome EHB135 Type B	3200 K	125	85B or C5	80	81A or C ⅛	100	NONE		81D or C ½	Increase 2/3 f/stop	C6	3/4 f/stop
Anscochrome Daylight	Daylight	32	NONE		80B or B4	12 6	80B+82A or B5	8 4	80C or B2	Increase 1 f/stop	81A or C ⅛	1/3 f/stop
Anscochrome Type B	3200 K	25	85B or C5	20	81A or C ⅛	20	NONE		81D or C ½	Increase 2/3 f/stop	C6	3/4 f/stop
Super Anscochrome Daylight	Daylight	100	NONE		80B or B4	40 20	80B+82A or B5	32 16	80C or B2	Increase 1 f/stop	81A or C ⅛	1/3 f/stop
Super Anscochrome Type B	3200 K	100	85B or C5	80	81A or C⅛	80	NONE		81D or C ½	Increase 2/3 f/stop	C6	3/4 f/stop
Dynachrome Daylight	Daylight	10	NONE		80B or B4	5 2.5	80B+82A or B5	3 1.5	80C or B2	Increase 1 f/stop	81A or C ⅛	1/3 f/stop
Dynachrome Type A	Photoflood	12	85 or C4	8	NONE		82A or B ⅛	10	81C or C ¼	Increase 1/3 f/stop	85B or C5	2/3 f/stop

NOTE A: It is advisable to use the light source to which each color film is balanced. However, those who divide their shooting between indoors and outdoors usually prefer to use artificial light type film and convert it to daylight rather than convert daylight film to artificial light with great loss in film speed and sometimes uncertain results.

NOTE B: To arrive at correct exposure, first determine proper f/stop for the guide number of the flashlamp and film. Then increase the f/stop opening by the amount indicated in the above column. SM and SF bulbs require no filter with Type A films.

NOTE C: As the color temperature of electronic units varies greatly, the data given above is only a starting point for experimentation with your own equipment. Daylight color films are recommended for all electronic flash work, and many units will not require any filtration with daylight films. The manufacturers of color film advise against converting any artificial light type film to electronic flash, but you may want to try it, experimentally.

CHAPTER ELEVEN

FILTERS FOR USE WITH COLOR FILM

THERE has been, unfortunately, too much confusion about filters for the color shooter. This confusion has been compounded by progress—filter manufacturers have discontinued whole groups of filters, replacing them with improved ones that experience and a more critical examination of the problems of filter use have shown to be superior in some or all respects.

Too many color workers have erroneous conceptions about filters—when to use and what to expect in the way of results. There is nothing complicated about the theory of a filter's function, but it is possible to become a little confused in practice. Actually, it is easier to understand and apply simple rules for the use of filters for color work than for black and white photography, or so it seems to me.

First, the primary purpose of a filter is to *subtract* (absorb) an *unwanted excess* color from the light reaching the film. Technically, one does not *add* color to the final result on film through use of a filter although a filter can create the illusion of adding saturation, purity or intensity to a given color through the process of subtracting an "abnormal" amount of complementary color through absorption. Carried to the extreme the final color result is the approximate color of the filter, as you have found if you ever, accidentally, made a color shot through a strong yellow or red filter designed for black and white work.

Second, it must be kept in mind that filters do not alter the color film; they alter or modify the light reaching the film. Film sensitivity, in normal emulsions, is a constant. The film merely records the color of light that reaches it. (See "Color Films and Light Sources," page 5.)

For all practical purposes all filters for color work can be grouped into three classes—or functions.

1. CONVERSION FILTERS—make possible the use of Artificial Light type film in daylight, or vice versa.

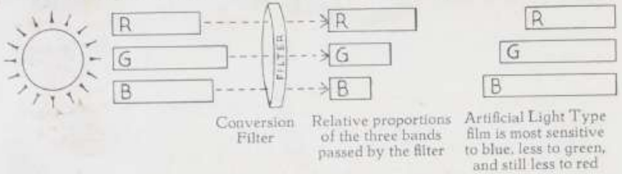
2. LIGHT BALANCING FILTERS—absorb unwanted excess red or blue in the light, such as the excess red in late afternoon light or the excess blue in the light at high altitudes.

3. COLOR (OR FILM) COMPENSATING FILTERS—alter the color result deliberately — to bring in balance out-of-balance emulsions — to mount with a transparency to subdue an unwanted overall color cast.

These simple graphs illustrate the function of the two most commonly used groups of filters.

CONVERSION FILTER

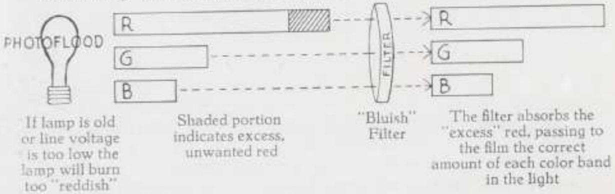
Converting Daylight Light to Artificial Light Type Film Balance


R
G
B
FILTER
R
G
B
R
G
B
Conversion Filter
Relative proportions of the three bands passed by the filter
Artificial Light Type film is most sensitive to blue, less to green, and still less to red

(The above graph is shown only to illustrate how these filters alter the relative amount of each color band that reaches the film. It is not a scientifically accurate plotting of the exact amount of each color band or of the film's sensitivity)

LIGHT BALANCING FILTER

Correcting (absorbing) excessive "warmth" in Artificial Light

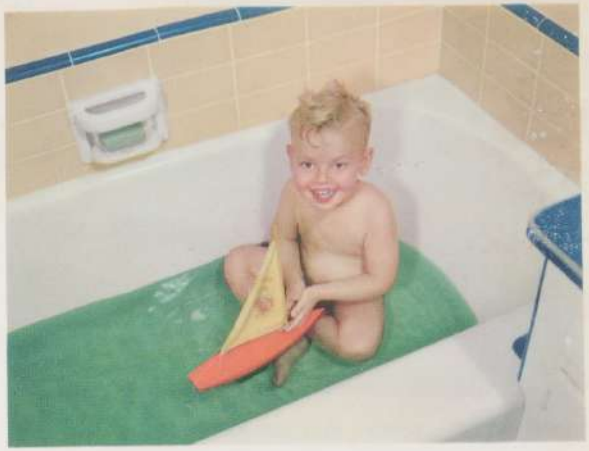

PHOTOFLOOD
R
G
B
FILTER
R
G
B
If lamp is old or line voltage is too low the lamp will burn too "reddish"
Shaded portion indicates excess, unwanted red
"Bluish" Filter
The filter absorbs the "excess" red, passing to the film the correct amount of each color band in the light

(The above is a very much simplified demonstration and would apply, as shown, only to the "weakest" of filters, although the principle of absorption would apply to all. Most filters absorb some of all the color bands, but absorb more of the unwanted excess color band. This overall absorption reduces the amount of light reaching the film, making necessary some compensation in exposure.)

Conversion Filters

The use of a conversion filter presupposes that the light to which the film is being converted is "normal." For instance, if Type F (clear flash) film is being converted with an 82A or B ⅛ filter to photofloods they should be relatively new and burned at rated voltage. Remember, Type F color films are balanced to 3800 K. Photofloods burn at about 3400 K. The light source is about 400 degrees "redder" than the light source to which the film is balanced. The excess red must be absorbed by a filter so the light reaching the film is 3800 K, a light balance that is 400 degrees "bluer" or cooler than from unfiltered photofloods.

(Continued on page 89)



LIGHT WALLS, CONFINED AREA, DIFFUSED LIGHT

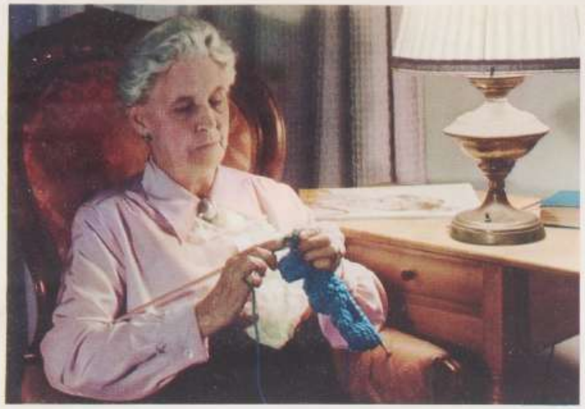
One of the problems in shooting color slides by artificial light is that of getting more benefit from the light than is obtained by the direct impact of it upon the subject. A figure seated in the middle of a large room is about as difficult to light properly as is one in the middle of the back yard in the dead of night.

The color shot above shows the other extreme in reflective conditions, and a most desirable one at that. The walls of the bath room are light, and being tile and enamel, are highly reflective. The room is small, and with the subject in the corner of this confined area, two lights in efficient reflectors produced about twice as much *usable light* as the same two lights would have done, at same lamp-to-subject distance, in a large room with dark or non-reflective walls. The light, in this case, was held rather than scattered and dissipated, was reflected back, kicked around and diffused, to create a type of general illumination that is best for this type of subject.

A child's delicate flesh tones are usually best recorded with this type of diffused light while more modeling is preferable for adults. In this shot, colored bath salts were added to introduce a "cool" color to offset all the warm and white tones. Without the green water the composition would have been weak in color and "thin" in appearance.

EXPOSURE: If walls are light and two No. 2 Photofloods (or two 3200 K Lamps) are used at about 5 feet from the figure, a satisfactory exposure would be secured at 1/25 second @ f/6.3; 1/10 @ f/10; 1/5 @ f/14. As conditions vary so greatly in subjects such as this one, exposures should be determined with a light meter. Expose for the flesh tones and let everything else come as it will, which will, incidentally be good under such conditions.

(Exposure for Kodachrome Type A ASA 16, EV No. 10)



SUBDUING THE "HARD" FEEL OF ARTIFICIAL LIGHT

The color shot of the little boy in the bath tub, shown on preceding page, looks more like ordinary home lighting than most artificial light color results because the light was reflected, diffused and softened. The color subject shown above has the feel of natural home lighting, but the effect was secured in quite another way and with little help from reflected light.

The lighting arrangement illustrated above is a variation of the black and white shown earlier. The result desired was to make the figure and surroundings appear as though the table lamp was the sole source of illumination. Such a lamp would, of course, create sufficient general illumination in a room so that all the figure would be easily seen and the colors identified by the human eye, in addition to "lamp-lighting" the planes of the figure that faced the light source.

But such a single light source, in a plane beyond that of the figure, is not sufficient for color photography. The planes facing the camera would go dark and colorless, so a supplementary front light must be used but kept at a distance from the figure so that it throws on the subject about half the intensity of light as that from the table lamp. The ratio can only be determined accurately with a light meter.

In this shot the white cloth lamp shade absorbed as well as diffused the light. Also, much of the light is dissipated because there is no reflecting surface to direct the light toward the figure, so it must be moved in close.

EXPOSURE: No. 2 Photoflood in table lamp, 18 inches from model's face, and a No. 2 Photoflood in standard reflector 7 feet from figure, near camera. Exposure for same conditions, 1/25 second @ f/4; 1/10 @ f/6.3; 1/5 @ f/9. If you are working in a more confined area and front light must be used closer to the figure than in this shot, use a No. 1 Photoflood in the front reflector at camera instead of a No. 2. Or if 3200 K Lamps are used, a 250 watt at camera position.

(Exposure for Kodachrome Type A ASA 16, EV No. 8½)

Many who divide their shooting between indoors and outdoors prefer to use artificial light type film, converting it to daylight when necessary. Generally speaking this procedure is more reliable and involves much less loss of film speed.

The Table on page 84 lists filters for conversion of any color film to any usable light source. However, the most commonly used ones are those for converting artificial light type film to daylight use. These are:

	EASTMAN	HARRISON	DECAMIRED
To convert Type A film to Daylight use	85	C4	R11
To convert Type B film to Daylight use	85B	C5	R13
To convert Type F film to Daylight use	85C	C2	R8

We often need to convert Artificial Light type films to two common light conditions. One is "Open Shade or Sky light" (a bluer than normal daylight condition) and "Late Afternoon" (a redder than normal condition). For "Open Shade" shots convert Type A films with a Harrison C5 filter—a C6 for Type B films. For "Late Afternoon" shots use a Harrison C1 for Type A film, a C2 for Type B films.

Light Balancing Filters

The only way to correct out-of-balance daylight is to correct the "balance" of the light reaching the film, through a filter. If the light is too "cool"—a color temperature more toward the blue than the film requires—a "warm" or complementary color filter will hold back the *excess* blue and transmit the warm colors. Or a "cool" filter will hold back the *excess* red in late afternoon light, for instance, and allow the blue to catch up, so to speak.

In artificial light work the light source does not vary to the extreme extent that daylight can and does. This would seem to indicate that light balancing filters are not needed for artificial light work. It does not work out quite that way.

Artificial light shots are close-ups and any "false" color rendition is easily detected. It is one case where you demand realism (except in effect shots), and a well trained eye can detect false color, especially in whites and high value neutrals, created by no more than 100 K degrees variation in the color balance of the light source.

On the other hand, every landscape (except for its immediate foreground) is greatly influenced by atmospheric conditions. The same scene may look different in color and tone value on a dozen successive days, or during different times of the same day. In fact, we often do not want to correct a daylight condition that expresses a mood or a mysterious unrealty. Such shots are often very beautiful.

The most complete series of light correcting (or light balancing) filters available at the moment are those made by Eastman and Harrison. Decamired filters are preferred by some amateurs because of the simple mathematics for selecting the proper filter for any conversion.

Eastman Light Balancing Filters

Bluish Filters	Exposure Increase in Stops*		Yellowish Filters	Exposure Increase in Stops*		Yellowish Filters	Exposure Increase in Stops*
No. 82	⅓		No. 81	⅓		No. 81E**	⅔
No. 82A	⅓		No. 81A	⅓		No. 81F**	⅔
No. 82B	⅔		No. 81B	⅓		No. 81EF	⅔
No. 82C	⅔		No. 81C	⅓		No. 81G**	1
			No. 81D	⅔		No. 81H**	1

*These values are approximate. For critical work, they should be checked by practical test.
**Discontinued but listed here because there are many in use.

The above filters raise or lower the effective color temperature of the exposing light. For instance, if you are using 3200° Kelvin lamps with Type A Film, an 82A would raise the effective color temperature to 3400° Kelvin, or about that of a photoflood lamp, for which the film is balanced. Or an 81A would lower the effective color temperature of a photoflood lamp for use with Type B Film. For special uses, figure that each successive filter step (for example from 82 to 82A, or 82A to 82B) alters the effective color temperature 100° Kelvin.

Harrison Light Balancing Filters

The Harrison series covers the same general use as the Eastman filters just listed, but the filters above C 3 and B 3 are primarily for conversion use rather than for correcting a moderately out-of-balance light condition, such as we have been discussing.

Bluish Filters	Exposure Increase in f/Stops	Yellowish Filters	Exposure Increase in f/Stops
B ⅛	½ f/stop	C ⅛	None
B ¼	½ f/stop	C ¼	¼ f/stop
B ½	¾ f/stop	C ½	¼ f/stop
B 1	¾ f/stop	C 1	¼ f/stop
B 2	1 f/stop	C 2*****	¼ f/stop
B 3	2 f/stops	C 3	½ f/stop
B 4*	2½ f/stops	C 4**	½ f/stop
B 5***	3 f/stops	C 5****	¾ f/stop
B 6	3¼ f/stops	C 6	¾ f/stop
B 7	3½ f/stops	C 7	1 f/stop
B 8	3¾ f/stops	C 8	1 f/stop

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*B 4 for conversion of Daylight film to photoflood illumination.
**C 4 for conversion of Type A film to daylight use.
***B 5 for conversion of Daylight film to 3200 K illumination.
****C 5 for conversion of Type B films to daylight use.
*****C 2 for conversion of Type F films to daylight use.

Color Compensating Filters

These gelatin filters have several uses—1) to shift a color result intentionally—2) to compensate when a lens produces results "cooler" or "warmer" than desired—3) to correct the color balance of a film emulsion that is slightly out of balance—4) to bind with transparencies to add a color cast (for effect) or to subtract an unwanted cast. These filters are needed to secure color balance when making color prints or positive transparencies from color negatives. For all uses except for making color prints one seldom needs more than the CC-05 to CC-20 filters.

Eastman Color (or Film) Compensating Filters

Peak Density	Yellow (absorbs blue)	Exposure Increase in Stops*	Magenta (absorbs green)	Exposure Increase in Stops*	Cyan (absorbs red)	Exposure Increase in Stops*
.025	CC-025Y	—	CC-025M	—	CC-025C	—
.05	CC-05Y	—	CC-05M	⅓	CC-05C	⅓
.10	CC-10Y	⅓	CC-10M	⅓	CC-10C	⅓
.20	CC-20Y	⅓	CC-20M	⅓	CC-20C	⅓
.30	CC-30Y	⅓	CC-30M	⅔	CC-30C	⅔
.40	CC-40Y	⅓	CC-40M	⅔	CC-40C	⅔
.50	CC-50Y	⅔	CC-50M	⅔	CC-50C	1

Peak Density	Red (absorbs blue and green)	Exposure Increase in Stops*	Green (absorbs blue and red)	Exposure Increase in Stops*	Blue (absorbs red and green)	Exposure Increase in Stops*
.025	CC-025R	—	CC-025G	—	CC-025B	—
.05	CC-05R	⅓	CC-05G	⅓	CC-05B	⅓
.10	CC-10R	⅓	CC-10G	⅓	CC-10B	⅓
.20	CC-20R	⅓	CC-20G	⅓	CC-20B	⅔
.30	CC-30R	⅔	CC-30G	⅔	CC-30B	⅔
.40	CC-40R	⅔	CC-40G	⅔	CC-40B	1
.50	CC-50R	1	CC-50G	1	CC-50B	1⅓

*These values are approximate. For critical work, they should be checked by practical test, especially if more than one filter is used. In addition to use as taking filters, the weaker of the above series (or the corresponding less expensive CP filters) can be bound with 35mm or Bantam films to correct over-all tints of false color, if only slight correction is needed.

DECAMIRED VALUES OF FILM TYPES AND LIGHT SOURCES

FILM TYPE	Daylight (18)	Clear Flash (26)	Electronic Flash (15)	Photoflood (29)	3200 K (31)
Daylight (18)	NONE	Filter B8	Filter R3	Filter B11	Filter B13
Type F, Flash (26)	Filter R8	NONE	Filter R11	Filter B3	Filter B5
Type A, Flood (29)	Filter R11	Filter R3	Filter R14	NONE	Filter B2
Type B, 3200K (31)	Filter R13	Filter R5	Filter R16	Filter R2	NONE

Decamired Filters in Use

To determine proper Decamired Filter for converting a color film to other than its normal light source the Decamired Value of the FILM TYPE is *subtracted* from the Decamired Value of the LIGHT SOURCE. For example, if Type F film is being used with photofloods we subtract the Decamired Value (for film) of 26 from the Decamired Value for photoflood which is 29. The difference is 3 (a plus 3) because the light source Value is higher than the Value of the film. A PLUS difference calls for a BLUE filter, in this case a B3. However, if we use Type B film (31) with clear flash (26) we subtract 31 from 26, a MINUS 5, and a minus difference calls for a RED filter, Decamired R5.

Decamired Equivalents

Decamired	Eastman	Harrison
B1	82	B⅛
B2	82A	
B3	82B	B¼
B4	82C	
B5	82C+82	B½
B6	82C+82A	
B7	82C+82B	B1
B8	82C+82C	
B9		B2
B11		B3
B12	80B	
B13		B4
B15		B5
R1	81A	C⅛
R2	81B	
R3	81C	C¼
R4	81D	
R5	81EF	C½
R6	81EF+81	
R7		C1
R9	85C	C2
R11	85	C3
R13	85B	C4
R15		C5

Experimental use of Color Compensating Filters. There are many interesting possibilities in the use of these filters, but such use should not be confused with the possible effects with colored lights, for the two procedures produce quite different results. One such use that I have found very successful is that of increasing the purity of color in such single hue subjects as a red rose. Some roses are "bluer" red than most color film will record faithfully, but by using a "bluish" filter such as an Eastman CC-10C or CC-20C bluish reds have recorded (on a normal emulsion) more nearly like one's visual perception of a red-red rose. These cyan filters absorb red, but it is my experience that they absorb more "orange" than red.

Pola-Screens

Like all other correcting or compensating filters the Pola-Screen has very definite uses. Before you use one thoroughly digest all the information furnished by the manufacturer, as to what it will do.

A Pola-Screen is used in artificial light color work for 1) photographing an illuminated store window at night, with camera axis about 35 degrees to the glass surface, 2) for subduing oblique reflections to show texture in non-metallic surfaces, 3) for photographing acetylene welding, and 4) for copying oil paintings. However, in copy work a Pola-Screen must also filter the light source or use a Kodak Pola-Screen Light for illumination. For outdoor work a Pola-Screen can 1) darken bright blue skies, 2) subdue reflections on water in back-lighted shots, and 3) penetrate atmospheric haze. With a Pola-Screen Viewer on the handle of the filter the desired correction can be arrived at without removing the filter from the lens.

Using Filters Without a Color Temperature Meter

Visual Selection of Filter to Use. If you suspect that a filter might improve a landscape shot, view the scene through each of the two or three weaker "Light Balancing" filters and select the one that makes the scene like you want it to appear in the transparency. With a little practice this visual selection of filters for subtle color change will pay off handsomely. Weak "warm" filters will improve most greens, unless you are using a color film that already over accentuates the greens. It is better to use a filter that is a little too weak than one too strong.

Start with a Basic Kit. Unless you have a color temperature meter, start with a minimum kit of filters. Don't be timid about experimenting with filters, especially the weaker ones, for they can improve your color results very considerably.

CHAPTER TWELVE

LENSES, DEPTH OF FIELD

THIS chapter can do no more than cover the depth of field aspect of lenses. To discuss the characteristics of all lenses for cameras using 120 film or smaller would fill a book.

Today's optical systems, except on cheaper cameras, are good in all respects. There was a time when some otherwise good lenses were not fully color-corrected. The photographer's problem is to select the type and focal length lens that will best handle his type of subject matter. No one lens will properly cover all photographic problems.

Three Types of Depth of Field Problems

Color photography indoors presents slightly different depth of field problems than those in shooting landscapes, for instance. But to be more specific as to the three types of depth of field problems, they are: 1) *Limited Depth of Feld*—when we wish to hold everying in focus that is properly illuminated by floods or flash, 2) *Out-of-Focus Backgrounds*—when we wish to throw out-of-focus everything back of a figure or still-life subject, and 3) *Great Depth of Field*—as in photographing an ice show, hockey game or night baseball or football game, when it is imperative that good focus be held from 25 or 30 feet to infinity.

Great Depth of Field

When shooting such expansive subjects as an arena one can often make good use of the Hyperfocal Distance of the lens and f/stop being used. Hyperfocal Distance is the closest point in sharp focus *at each f/stop* when a lens is focused on infinity. These distances are given by the figures in the first line of each of the Depth of Field Tables on pages 95 and 96. The *greatest* depth of field at *any* f/stop is secured when focus is on the Hyperfocal Distance. Then everything from *one-half* the Hyperfocal Distance to Infinity will be held in sharp focus. Refer to the table for a 50mm lens (page 96) and note that when it is set at f/8 and focused on infinity everything is in focus from about 20 feet. But when focus is on that 20 foot distance everything will be in focus from 10 feet. Carry a card showing the Hyperfocal Distances for your lenses at all f/stops. You will often find it very helpful.

Limited Depth of Field

A typical indoor subject could be three or four people in an interesting setting, one or two seated and others standing behind them. We would wish to hold everything in focus that is well illuminated. Most such subjects are shot at camera-to-subject distance of 5 to 10 feet. Focusing must be accurate and should be on the closest plane of the subject, or only slightly back of that plane. The graph (opposite page) shows that, at f/5.6 or smaller f/stop, focus carries through much farther from point focused upon than it holds forward of that point.

Refer to the table for 50mm lens (top of page 96) and note how rapidly the depth of field *decreases* as camera is moved closer to the subject. At 4 feet, at f/8, depth in critically sharp focus is only about 17", but at 8 feet depth is increased to almost 7 feet. Longer focal length lenses present still more of a depth of field problem.

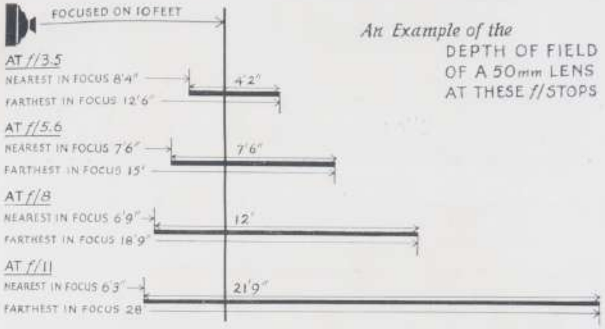
Deliberately Throwing Backgrounds Out-of-Focus

In the early days of color photography it was heresy to expose a shot with the background out of focus. That day is past. If a background is cluttered it can distract attention from the center of interest but when such are deliberately thrown out of focus the center of interest seems sharper and the shot has a three-dimensional effect. Also, out-of-focus color seems less intense and certainly more atmospheric. The character of the subject AND background determine when the background should be soft. For the effect, use the largest f/stop that will hold the center of interest sharp—*and that only*.

Know the Depth of Field of Your Lenses

Even though you use a ground glass focusing device it is all but impossible to determine, at f/stop 8 or smaller, just how much depth of field you may be holding in sharp focus. You can check with the diaphragm open, but that is probably not the f/stop you will use in shooting, so you still have no accurate check. Whatever your lens, get a depth of field table for it when you buy, or write the manufacturer of the lens.

There is understandable confusion about how much any lens holds in sharp focus, at any given f/stop, and at various distances from camera to subject. Some shooters make the mistake of assuming that if they use a small enough f/stop the lens will "back up" (from distance focused upon) as much as it will carry through toward infinity. A glance at the chart below makes it quite clear that lenses hold more in focus beyond the point focused upon than in front of this focus point. At f/3.5 (when focused on 10 ft.) a typical 50mm lens "backs up" 20 inches, but it carries through 30 inches. At f/11 it "backs up" 3 feet 9 inches but carries through 18 feet. Remember that as you stop down the distance in sharp focus increases rapidly, but the amount brought in focus nearer than the focus point increases but slightly. Never focus halfway between the nearest and farthest points you hope to hold in focus, but focus either on the nearest point you wish to hold sharp, or slightly back of it.



The above chart is shown to emphasize that stopping down the lens greatly increases the depth of field beyond point focused upon, but not much in front of focus point. (Focusing with ground glass cameras should be done with the lens wide open.)

DEPTH OF FIELD TABLES

Theoretically, a depth of field table for a lens of a given focal length is good for all lenses of that focal length. But for critical work it is best to have a table for your particular lenses. If other tables vary from those given here it can be due to the circle of confusion upon which they are based. Although 1/500 inch is a common factor some tables are based on 1/250 inch, others on 1/1000 inch. Halving or doubling the circle of confusion halves or doubles the Hyperfocal Distance figures, for instance (the bold figures in top line of each table).

Distances expressed in feet and inches. (Circle of Confusion 1/500 in.)

AN f/3.3, 35mm LENS

Distance focused on	Diaphragm Openings									
	f/3.3		f/5.6		f/8		f/11		f/16	
	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.
INF.	**24**	inf.	**14 6**	inf.	**10**	inf.	**7 6**	inf.	**5 3**	inf.
35 feet	14 6	inf.	10 3	inf.	8	inf.	6 3	inf.	4 6	inf.
15 feet	9 4	40	7 6	inf.	6 3	inf.	5	inf.	4	inf.
10 feet	7 3	17 9	6	32	5 3	inf.	4 4	inf.	3 6	inf.
8 feet	6	11 9	5 3	17 6	4 6	36	4	inf.	3 3	inf.
6 feet	4 9	7 9	4 4	10	3 9	14	3 6	29	3	inf.
5 feet	4 3	6 3	3 9	7 6	3 6	9 6	3	14 6	2 9	130
4 feet	3 6	4 8	3 3	5 4	3	6 4	2 9	8	2 4	16
3½ feet	3 1	4	2 11	4 6	2 8	5 1	2 6	6 3	2 3	9 10

Shorter focal lengths have greater depth, at any given f/stop, than do longer focal lengths at same f/stop, focused at same distance. Compare this table with the others.

DEPTH OF FIELD TABLES (Continued)

AN f/3.5, 50mm LENS

Distance	Diaphragm Openings									
focused	f/3.5		f/5.6		f/8		f/11		f/16	
on	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.
INF.	47	inf.	29	inf.	20	inf.	15	inf.	10	inf.
50 feet	24	inf.	19	inf.	15	inf.	11 9	inf.	8 9	inf.
25 feet	16 6	53	13 9	162	11 6	inf.	9 6	inf.	7 6	inf.
15 feet	11 6	22	10	32	8 9	55	7 9	inf.	6 1½	inf.
10 feet	8 4	12 6	7 6	15	6 9	18 9	6 3	28	5 3	inf.
8 feet	6 11	9 6	6 5	10 9	5 10	12 8	5 4	16 4	4 8	32
6 feet	5 4½	6 9	5 1	7 1	4 9	8 2¼	4 5	9 6	4	13
5 feet	4 7	5 6	4 4	5 10	4 2	6 4	3 11	6 6	3 6	9
4 feet	3 8¾	4 4	3 7	4 6½	3 5½	4 10	3 3	5 3	3	6 1½
3½ feet	3 3⅝	3 9	3 2	3 10¾	3 1	4 1¼	3	4 5	2 9	5 1

AN f/3.5, 75mm LENS

Distance	Diaphragm Openings									
focused	f/3.5		f/5.6		f/8		f/11		f/16	
on	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.
INF.	70	inf.	43 4	inf.	30	inf.	23 4	inf.	16 8	inf.
66⅔ feet	33 4	118 8	26 8	inf.	20	inf.	16 8	inf.	13 4	inf.
33⅓ feet	22 8	63 4	19	136 8	16 8	inf.	13 4	inf.	10	inf.
20 feet	15 8	28	13 6	36 8	12 4	56 8	10	86	8 8	inf.
13⅓ feet	11 2	16 6	10 2	19	9 4	23 8	8 4	35	7	103
10 feet	8 7	11 8	8 2	13	7 6	15	6 10	18 8	6	28 4
8⅓ feet	7 5	9 5	7	10 4	6 6	11 6	6	13 8	5 4	18 4
6⅔ feet	6 1	7 4	5 9	7 10	5 5	8 6	5	9 8	4 8	11 8
5 feet	4 8	5 4	4 6	5 7	4 3	5 11	4	6 6	3 9	7 6
4⅓ feet	3 11	4 5	3 9	4 7	3 8	4 10	3 6	5 2	3 3	5 7
3⅓ feet	3 2	3 6	3 1	3 7	3	3 9	2 10	3 11	2 8	4 3

AN f/3.8, 135mm LENS

Distance	Diaphragm Openings									
focused	f/3.8		f/5.6		f/8		f/11		f/16	
on	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.
INF.	310	inf.	217	inf.	150	inf.	130	inf.	74	inf.
200 feet	119	inf.	103	inf.	85	inf.	72	inf.	54	inf.
100 feet	75	148	69	176	59	inf.	52	inf.	42	inf.
50 feet	42	59	40	65	37	75	34	90	30	148
25 feet	23	27	22 6	28	22	29	21	39	19	36
15 feet	14 5	15 9	14 3	16	13 10	16 6	13 5	17	12 9	18 4
10 feet	9 9	10 4	9 8	10 5	9 6	10 7	9 4	10 10	9	11 3
8 feet	7 10	8 2	7 9	8 3	7 8	8 4	7 6	8 6	7 4	8 9
6 feet	5 10⅞	6 1⅛	5 10⅜	6 1½	5 9⅝	6 2⅛	5 9	6 3	5 8	6 4
5 feet	4 11⅜	5 ⅝	4 11	5 1	4 10¾	5 1¼	4 10¼	5 1¾	4 9½	5 2⅝
4 feet	3 11⅝	4 ⅜	3 11⅜	4 ⅝	3 11⅛	4 ⅞	3 10⅞	4 1⅛	3 10½	4 1½

If you have lenses of the focal length for which depth of field data is given above, refer to these tables when shooting any subject where critically sharp focus is necessary for satisfactory results. You can roughly compute depth of field of other lenses with focal lengths not too different from some of those here shown. Knowing what depth can be held will often determine what f/stop you should use, which in turn will dictate shutter speed for that particular shot.

CHAPTER THIRTEEN

MOUNTING–FILING–PROJECTION

MANY color slide shooters have never seen the results of their efforts under even reasonably ideal projection conditions. I suspect most such color workers have incorrectly attributed all apparent unhappy results to errors in shooting. Exposing a good slide in the camera is only one phase of fine color slide production. Faulty projection can all but ruin the finest of color shots. It is equally true, of course, that the most perfect projection conditions cannot make a bad slide good.

Seeing color slides on the screen at the best possible advantage calls for careful mounting, a good projector with a projection bulb of the proper wattage, and a good screen, and the *type* of screen that best suits the area in which the slides will usually be projected.

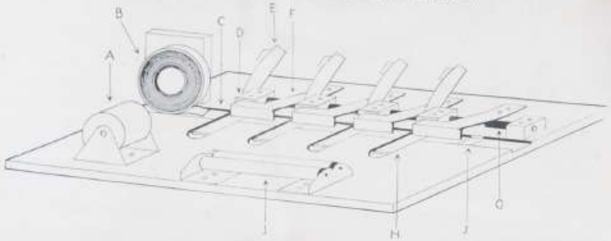
If your friends are to enjoy showings of your shots, present them in the most interesting manner possible. Several steps in the routine are possible and practical, and the degree of enjoyment will depend greatly upon how much thought and work you put into the organization of your shows. *First*, slides should be in orderly sequence, especially if a series presents a connected story. *Second*, title slides inserted at the beginning of each change in theme or subject will add greatly to spectator interest and will eliminate much oral explanation. *Third*, subdued background music will make any slide show immeasurably more enjoyable. *Fourth*, and the final professional touch is tape recorded comments about each slide, such comments superimposed on subdued background music. If possible, the character of the music should fit the general subject matter of the show, like a Hawaiian musical background for shots made on a trip to the Islands.

Proper Mounting Assures Better Projection

It seems a little inconsistent to spend money for film and thought and effort in making a good color shot and then be careless about protecting and preserving them after they are made. None of us wish to put every shot into a permanent slide file. But all shots that deserve permanence should be immediately protected against dirt, finger marks, and general abuse, by putting them in good mounts. There are all kinds of mounts, some good, some make-shift. It is still hard to find a genuinely more satisfactory mount than glass, tape bound.

If you do a considerable amount of mounting in glass and tape, and if you are mechanically inclined, make a mounting device similar to that suggested by the drawing below.

DEVICE FOR TAPE BINDING GLASS SLIDES



First, mill a channel, (C) tape width, about 1/16" deep in base stock. Vulcanized Masonite is good material. The four cutting knives (E) should be mounted rigidly to the rod shaft (G) which is held in alignment by the bearing blocks (D). The knives shear against a metal cutting edge (H) recessed so top surface is flush with the bottom of tape channel. Tape (B) is pulled through to a guide stop (J), spaced, with the knives, at 2" intervals for 2"x2" glass. The spring steel clamps (F) hold tape firmly in place while cutting. They are lowered into position by a cam action, a notch filed in the shaft. These clamps also serve as centering guide when glass sandwich is placed on tape. When glass is pressed firmly against a section of tape lift the sandwich and roll edge over roller (A) to seal firmly, then insert the edge with tape between the two soft rubber rollers (I) which will fold and seal the tape. Repeat the performance for other three sides, and the slide is bound better than can ever be done by hand. If this seems like too much machinery, cutting knives can be eliminated and cuts made with a razor blade, but some device will be necessary for raising and lowering the spring clamps.

If all this sounds like too much of an undertaking perhaps you should buy the mounting equipment needed, and there are several good devices on the market. They will save much time and will help do a better job of mounting and binding.

To prevent Newton Rings: 1) if your color film is returned from processor in uncut strip reverse wind it and leave it that way two or three days, or 2) make a thicker mask by adding one-half of a mask to the regular one, or 3) use anti-Newton ring mounting glass, a glass which is lightly etched on one side. With etched surfaces facing the film they break up the patterns that cause Newton rings.

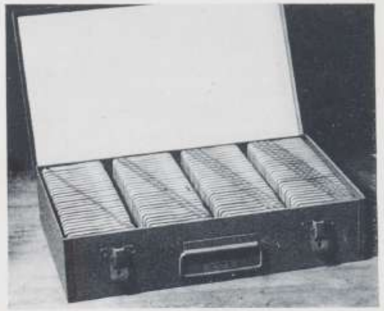
Orderly Filing Saves Time, Makes More Enjoyable Shows

A place for everything and everything in its place might well have been coined as an admonition to the slide maker. How many slide shooters ruin their own pleasure and the enjoyment of their friends by showing conglomerate assortments of slides I do not know, but too many.

But, you say, I have a lot of miscellaneous slides that have no story sequence. Probably true, but these can be grouped to keep related subject matter together, at least.

Picture stories should be carefully thought out and the slides edited in much the same manner one does movies. The sequence of showing need not be the order in which the shots were made, as the story may be strengthened by altering the order somewhat.

After slides are filed in the order desired keep them that way. A written record of titles and file number designation will help, but there is always the hazard that a file may be pied, to use a printer's term, and it could take an hour or two to put the scrambled lot back in order. The illustration below suggests one sure way to make re-filing swift and accurate. The diagonal markings can be colored tape, or better yet, a painted stripe across the top of the slides.



A diagonal stripe across the top edge of filed slides makes it possible to get slides back into proper order quickly and easily should they become mixed. It also serves as a check on a missing slide.

Titles For Slide Shows

When well done, titles inserted in a movie story at proper intervals all but eliminate the necessity for oral comment or explanation. Has it ever occurred to you that titles can do as much for a slide show? If you have ever seen a carefully titled slide story sequence you know how much titles can add.

The average spectator doesn't expect detailed explanation of each slide if the subject matter is largely self-explanatory. When you feel a natural question might arise about a certain portion of a picture story, answer it with a title slide. Such slides help carry over from one set of scenes to another and lead the spectator easily from one interest to a new one. This is particularly true of a travel show. There should be a title slide for each geographical change at least. If the series comprises several national parks, for instance, there most certainly should be a title slide to introduce each park.

Titles should be in color. If the subject of the series is scenic, buy a cheap color reproduction of some scene in the area, superimpose movie title letters on the picture and shoot a title slide. Try titling one of your slide shows and prove what a professional touch it adds.

Background Music and Recorded Commentary

Atmosphere for a slide show can be provided by background music, in subdued volume, and it is surprising how "dead" a show seems after you have once experienced what music can add. If you have a record changer so much the better, and the problem will be much simplified.

The ultimate in dressing up a slide show is a subdued musical background upon which is superimposed recorded comments about each slide, especially if the subject matter can be made more understandable through such comments.

The best job of tape recorded comment superimposed on a musical background that I have heard was produced by my good friend George Blaha, of Chicago, one of the country's better known slide shooters. Here are his suggestions on equipment and methods.

"Basic equipment needed for producing high-quality tape recording are a recorder and recording microphone, a public address system suitable for reproducing voice and music, and a double turntable phonograph. Best results will be obtained if the recording is made in a sound-proof room. Three people are needed—one person to control the public address system and music, a second person to operate the tape recorder and act as general coordinator, and lastly, the commentator. They should be positioned in a triangular arrangement with the operator of the tape recorder in the middle. Prearranged signals should be determined so that very few, if any stops are made during the entire recording period. So far as I know, background music must be recorded simultaneously with the commentary on all currently available recorders. This creates a problem if stops are necessary, erasures made and the music resumed at the stopping point so there will not be an obvious break.

"An amplifier with at least two channels produces good results since one may be connected to the commentator's microphone and the other to the double turntable which produces the music. This permits monitoring of both voice and music and allows one to hear the program as it will sound in its final form. The microphone of the recorder should be placed near the outlet speakers. The commentator with his microphone should be opposite but facing the operator of the p. a. system. Test recordings should be made to determine the voice and music levels. Keep the music soft so it will not compete with the commentator. The function of the music is to create atmosphere, to fill the gaps between comments, and should always be supplementary to the voice telling the story.

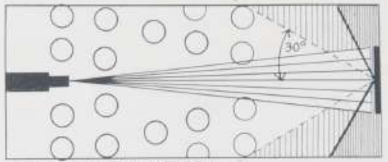
"Satisfactory results may be obtained by using just the microphone of the recorder for the entire recording if a p. a. system is not available. But it is not so easy to modulate the voice and music with this arrangement. The voice distance must be determined and the speaker furnishing the music set at a distance so that it will blend with the voice at the proper tone level. No monitoring can be done while the recording is being made and the result cannot be heard until the playback

"If slides are projected as commentary is being recorded, do not use a projector with a cooling motor as the noise of the motor will be picked up. If you wish to establish an accurate interval each slide is to show on the screen (as some should be shown longer than a brief comment) tap the microphone lightly with a pencil as a signal for slide change. This slight ping noise will hardly be noticed by spectators, and such a device makes it possible for any one to give the show properly."

Good Projection Is as Important as Correct Exposure

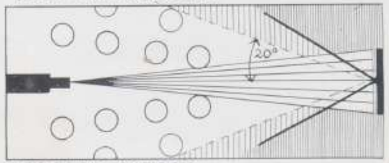
Correct exposure produces a color slide of the proper density—it is neither too "thin" nor too "heavy." When projected, a properly exposed slide can appear too thin or too heavy if the projector lamp is too large or too small, for the picture size desired. For my part, I prefer 100% too much light (for normal slides) rather than 50% too little.

There is a direct relation between lamp wattage and type of screen used. A white matte screen requires about 2½ times the level of illumination needed for a beaded screen. Satisfactory results cannot be achieved when screens are interchanged unless lamp wattage is also changed. Other screen characteristics are indicated below.



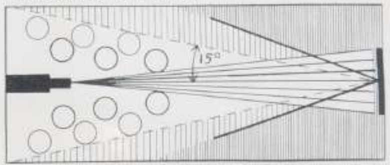
FLAT-WHITE SCREEN

A flat-white (matte) screen has the widest angle of image brightness, permitting spectators to sit farther to each side from the projection axis, up to 30° angle. Best viewing distance is from 2 to 2½ times the picture width back to 6 times this dimension. If picture width is 3 feet, closest viewing distance is 6 to 7½ feet, farthest 18 feet.



BEADED SCREEN

A beaded screen has a somewhat narrower angle of image brightness and spectators must sit closer to the projection axis, within a 20° angle. When picture is viewed from beyond this angle image brightness is noticeably diminished. Viewing distance from 2½ to 6 times picture width.



ALUMINUM-PAINTED SCREEN

An aluminum painted screen has the narrowest angle of image brightness and spectators must sit still closer to the projection axis, within a 15° angle. This type of screen (on flat hard surface like vulcanized Masonite) is best for projected stereo pictures.

Determining Proper Level of Illumination. Put a blank slide (slide with proper mask, but no transparency) in the projector and with a light meter read the light from the projector at screen position, with meter pointed directly at the projector. Hold meter in the center of the light beam. Do not read the light reflected from the screen. If you use a Weston Meter make reading with the baffle open, using the low light scale. If a G. E. PR-1 do not use the incident light attachment. Minimum readings should not be below the lower figure given in table below, for Weston meters.

METER READINGS OF SCREEN ILLUMINATION

	Matte Screen	*Beaded Screen*
Weston Cine I or II	12 to 15	9 to 11
Weston Master III or IV	13 to 20	5 to 8

(Instructions in text must be followed or readings will be inaccurate. These illumination values give, as a minimum level, what is usually listed as amply adequate. Personally, I prefer enough light to favor the darker colors and tones in a projected slide.)

Lenses and Lamp Wattage Greatly Affect Results

No general table can fit all projection conditions but the figures given below will serve as a guide in checking your equipment—lens focal length and speed, lamp wattage, et cetera. However, there is no better check than what your eye sees. If your projector does not throw a brilliant image at the distance you desire, for the picture size wanted, move the projector toward the screen until proper brilliance is achieved. Check this distance against that you wish to use, and give these facts to your photo dealer. He can suggest what changes are necessary in lamp wattage or lens focal length, or both. Do not be content with poor or even mediocre projection results. You do not have to, as the situation can be remedied.

A TABLE FOR CHECKING PROJECTION RESULTS

Screen Size	*Lamp Wattage*	*Lens Focal Length*	*Average Projector-to-Screen Distance*	
			Matte Screen	*Beaded Screen*
30"	150W	4"	7' to 8'	11' to 12'
40"	150W	4"	9' to 10'	13' to 15'
40"	150W	5"	10' to 11'	15' to 17'
40"	300W	5"	12' to 13'	18' to 20'
48"	300W	5"	13' to 14'	19' to 21'
48"	400W	5"	15' to 16'	21' to 23'
60"	400W	5"	16' to 18'	24' to 27'
72"	500W	5"	22' to 25'	32' to 36'

(Longer focal length lenses require more distance to secure same picture size, and if much increased, lamp of increased wattage might be necessary.)

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